*Vol.* 88, *No.* 10 New York, September 4, 1926 *Pages* 461-512

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# Electrical World

*The Consolidation of Electrical World, Electrical Engineer and American Electrician*

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**McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., NEW YORK, N. Y.**

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Cable Address "Machinist, N. Y."

Publishers of
Engineering News-Record — American Machinist
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Journal of Electricity
*(Published in San Francisco)*
American Machinist—European Edition
*(Published in London)*

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.
**Circulation of this issue, 19,775**

The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra foreign postage, $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.
Change of Address—When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1926, by McGraw-Hill Publishing Company, Inc.

Published weekly

Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.

**Advertising Index—Alphabetical, 118; Classified, 112, 114, 116; Directory of Engineers, 50, 51; Searchlight Section, 52-58**

# Pittsburgh Polyphase Transformer
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# Electrical World

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W. H. ONKEN, JR.
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VOLUME 88 — *New York, Saturday, September 4, 1926* — NUMBER 10


## Electrical Engineers Gather at Salt Lake

AN UNUSUALLY good program is announced for the Pacific Coast convention of the American Institute of Electrical Engineers to be held at Salt Lake City from September 6 to 9. Some of the papers promise to be outstanding contributions to the art and should give rise to fine discussions.

The protection of oil tanks against lightning has been the subject of intensive study by F. W. Peek, Jr., and his paper will give a solution of this difficult problem based on a large number of tests and an analytical study of the results. The very useful klydonograph has been limited in its employment because of lack of knowledge of how to calibrate the photographic figures denoting line disturbances. K. B. McEachron is to present a paper giving new data for calibrating and interpreting these Litchtenberg figures. Professor Ryan and his laboratory will be represented by a paper on the space charge around a conductor. Other technical advances in the art will be presented by other specialists.

Not all the papers will be highly technical; there will be a happy mixture of more practical ones. Professor Sorenson will present some experiments on vacuum switches which may have an important bearing on the development of breakers for interrupting heavy currents. Communication achievements of a practical and theoretical character are to be described, and scattering papers on power shovels, transmission, mining, education and measurements will round out the attractive business program.

It may be taken for granted that Salt Lake City hospitality will well live up to the laurels it has won in the past. The series of entertainments, trips and inspections outlined are certain to be appreciated. An outstanding series of papers with these added attractions should cause a large attendance.

## Better Salesmanship Needed in Central-Station Industry

TWO extensive surveys conducted independently show that the average annual consumption of electrical energy per home is 365 kilowatt-hours. This is an average of exactly one kilowatt-hour a day. From the same data the weighted average rate is 7.64 cents a kilowatt-hour. This means that the average family spends less than eight cents per day for electricity. Considering the present standard of living—what is spent for automobiles, for gasoline, for spring hats, for theaters, for cigarettes—can the commercial departments be proud of this average expenditure for electrical energy? If homes were well lighted and fully equipped with the smaller appliances, there would be an obvious excuse. But this is not true. It has been shown that the American home is only half lighted. The consumption of electrical energy must be trebled before there will be adequate and convenient utilitarian lighting, without taking into account the wholly legitimate use of light for purely decorative or esthetic purposes. Furthermore, an average of only two electric appliances is to be found in the homes, notwithstanding the dozen small appliances which are a boon to the householder.

The plain fact is that the central-station company has not awakened a lighting consciousness in the home. It has not sold the "do it electrically" idea. A few aggressive commercial departments are going after new business. They are not content with or blinded by the natural growth of the residential business as a whole; they are developing more business per home. But throughout the country the progress in this direction is slow and meager, considering the potential business in the home which will eventually reward real salesmanship. No excuses will stand against the fact that the average household is spending only about eight cents a day for electrical energy. If it were not for the increase in the total residential consumption due to adding many new customers annually, the commercial departments long ago would have been indicted for lack of salesmanship or, at least, for neglect of opportunity.

## The Investment Banker's Responsibility

TRANSITION periods in human affairs are seldom free from danger. As the centralized control of light and power properties spreads, opportunities multiply for speculative activity; the temptation to "cash in" upon future earning power besets the promoter, and the investment banker is in many instances confronted with the choice between conservative financing and inflation in underwriting consolidations and holding-company security issues.

Commission regulation of rates amply protects the consuming public in this period of changing ownership, and the investor is legally entitled to a fair return upon a proper rate base. With adequate earnings and good management he is sure of it. The capitalization of many utility companies is closely regulated in many states, with intelligent appreciation of the public welfare and recognition of the perpetual need of attracting new money for developing larger and better service. The high credit standing of light and power companies proves the soundness of the industry's basic corporate units.

In marketing the securities of operating companies the investment banker performs a useful public service and deserves reasonable compensation, but the risk is generally small and the task of distributing such securities relatively simple. The competition of other securities for the investor's surplus funds may be keen, but the marketing of seasoned utility stocks and bonds is largely a matter of competent salesmanship. The real challenge to the investment banker's judgment comes in the pressure upon him to participate in the underwriting of some form of merger securities. Here his re-

sponsibility is great, not only to his customers—and so to the public—but to the owners of securities which may be involved in the changes proposed.

The reward for promoting an economically justified merger may well be liberal. The good name of the industry is made up in part by the reputation it and its underwriting bankers bear with the investing public and in part by the equity of prevailing rates and quality of service rendered. Since utility securities are normally on sale in the open market like any other commodity, the investor is co-responsible with the banker as a maker of that market, but upon the latter lies the greater burden. Integrity and ability of the highest order are demanded of the investment banker who concerns himself with utility mergers and their financing. The keys to public confidence in the industry are largely in his hands as regards investment stability, and severe indeed should be the condemnation visited upon those unworthy members of a great and honored profession who attempt personal gain by promoting unsound deals beyond the scope of local regulation.

## Prices of "Mazda" Lamps Go Down Again

BETTER manufacturing methods and standardization and simplification of lines have again proved the value of their application in the industry. By continually applying these principles to lamp manufacture the General Electric Company has scored many triumphs, the latest being its announcement of a further reduction in the prices of "Mazda" lamps. Prices of these lamps are now 44 per cent below the 1914 prices, yet the average cost of commodities shows a 65 per cent increase since 1914. This is the eighth reduction of "Mazda" lamp prices since 1920, and this last reduction alone means a saving to the public of approximately $4,000,000 a year. The figures speak eloquently of the stewardship of the company in reducing costs and passing the savings along to the public. Lamp manufacture does not stand alone in this regard, but it does set a pace for the manufacturers of other products.

## Repair Parts Should Be Always Available

DIFFICULTY in obtaining repair parts for household electrical appliances has been complained of by more than one central-station company. During the past summer this situation with respect to some makes of electric ranges and refrigerators has become acute in a number of localities. It has caused annoyance to the users of these devices, and the power companies feel that their reputation for service is being jeopardized. Delay in receiving material from manufacturers has made it necessary oftentimes to rob appliances on the sales floor and in the stockroom of certain parts to make repairs on customers' devices.

Such a condition does not speak well for either the manufacturers or the utilities. Good servicing calls for an ample stock of parts so that it will not be necessary for a utility company to telegraph a rush order to the factory and then perhaps learn that there may be from one to three weeks' delay in shipment. Manufacturers who take pride in their products usually have available adequate stocks of parts and are always in a position to meet emergency calls for material necessary to put their product in service. True, the demand for and sale of electrical appliances have been such as to tax utilities' sales departments and manufacturers' production. Still, service cannot be overlooked and has become more important than ever. Uninterrupted operation of appliances on the customers' premises is essential not only for the convenience of customers but also in order that the reputation of electrical devices for dependability may be built up and maintained. Upon this basis future sales depend.

## Impressions of the Electragists' Convention

GERARD SWOPE struck the keynote of what would appear to be a new era opening for the electrical contracting industry when he appealed to the annual convention of the Association of Electragists International at Cedar Point, Ohio, last week to maintain high standards of electrical construction and to improve their knowledge of costs and increase their price courage so that they may enjoy a fuller measure of prosperity, as befits men rendering so vital a service to the electrical industry and to the public.

From the standpoint of numbers alone the convention brought surprising evidence of the growing strength and influence of this organization, for the registration totaled nearly a thousand, in marked contrast with a typical meeting of a few years ago. But of even greater interest to the observer were the indications of practical purpose in the policies which the officials and management of this association are now following. The development of estimating and cost keeping for electrical construction and the systematic education of the membership in the economics of the business are receiving precedence, and progress is clearly being made. The trade policy committee has just completed a study of the "balance sheet of distribution" that is a valuable contribution to the industry's statistical knowledge. Moreover, the association has gained four hundred in membership, which is encouraging, for the need of membership is its greatest weakness.

Above all, however, there is a commendable show of courage in the position which the electragists have taken as the champions of a high standard of wiring construction. The price paring of the "curbstone" contractor has been a blight upon the business, and it was in the hope of elevating both the ethics and the economics of the trade that the name "electragist" was adopted to indicate the superior electrical contractor. The electragists are pursuing this ideal even to the extent of taking open issue with the central-station branch of the industry over the "all-metal standard" program which the A.E.I. is advocating. On their initiative the question of the cost of wiring is to be submitted for study to an industry conference now soon to convene.

It looks as though this militant nucleus of the great army of electrical contractors and dealers has found itself and is on its way under capable leadership. The contractor forms the first line of contact between the

electrical industry and the public, and upon the quality and the adequacy of his work depends the extent to which electric service is used and enjoyed. There are in the United States approximately twenty-five thousand contractors. Surely the proficiency and the prosperity of these men are a matter of interest to the entire electrical industry. President Fowler and General Manager Davis of the Association of Electragists are to be congratulated on their good record. They deserve hearty support.

## The Cat, the Kittens and Electricity Rates

THE farmer cut a hole at the bottom of the barn door so the cat could get in and out. Then, when in the natural course of events the progeny arrived, he cut a smaller hole in order that the kittens might get in and out too.

The first domestic business of the electricity supply companies was the furnishing of energy for lighting. This required a rate of a certain magnitude. The lighting energy entered the home through a meter. Then, with the passage of time, there arrived a progeny of other domestic uses for electricity, which required the fixation of rates of lesser magnitudes than that for lighting alone. Some companies recognized the fact that the kittens could pass through the same hole in the barn door as did the mother cat and they passed the energy at different rates through one meter. Other companies thought that a smaller hole should be cut for the kittens and they installed a second meter for the low-rate energy.

There is no intent here to imply that all central-station companies that make a practice of installing two meters for complete domestic service occupy the same plane of intelligence as did the farmer who cut a big hole and then a little hole in the barn door. That would only appear to be true to those who have no knowledge of the intricacies of the electricity supply business; there is a very reasonable explanation of the two-meter, two-rate situation that now exists. Wisdom is readily shown in retrospect. The important point is that evidence now shows that an intelligently managed utility will try to attain the single-rate, single-meter practice for residence business.

## Manufactured Weather a New Electrical Application

AIR conditioning by the use of electricity offers a very good opportunity to the electrical industry. It is a new load-building possibility which has been exploited very slightly. Equipments and automatic controls exist to maintain air at any desired temperature, to fix the humidity at any desired point, to keep air clean and to distribute air in any amount with any velocity desired.

Control of the temperature of air has been practiced in some degree. Ten or fifteen motion-picture theaters at least have installed equipment to cool air, and the box office has found this a very profitable move. More than fifty other theaters plan to do this soon. Thus this market alone is very large. Another application of air conditioning is in large department stores. The air is washed, the humidity and the temperature are controlled on a planned basis. As a result of these installations the stores have had an increased business and more contented and healthy employees. The air conditioning paid dividends.

In the Pennsylvania Hotel at New York, the Mellon National Bank, hospitals, public buildings and other gathering places air conditioning and distributing equipment has been installed with splendid results. In industries such as food products, textiles, chemicals and building materials air conditioning and control equipment have been found a great asset of production. Yet only a very few of the many applications have been made, and the commercial departments of the utilities can do much to obtain a greater saturation in this very desirable load. A copy of a booklet entitled "Manufactured Weather," issued by the commercial department of the Duquesne Light Company, has just been received. This shows briefly and well the opportunities and uses of air conditioning from the standpoint of customers and is a very laudatory departure in the literature of business promotion. Other utility companies will do well to look into the possibilities of this kind of business.

## Trained Men Essential to Refrigeration Programs

A STUDY of electric refrigeration conditions in more than 150 localities shows unanimous agreement on the point that trained men are essential. The salesmen, the installation men and the service men must be trained for a period of from two weeks to three months if satisfactory results are to be obtained. Agreement is not had on the definite time required for training because experience differs in different localities, with the product sold and with the type of men used. Manufacturers' schools for training refrigeration men are, however, agreed upon as necessary and highly influential in determining success or failure in the business.

Refrigeration salesmen should be specialized men who know the product they sell intimately, who know how it should be sold and who know how it should be used by the buyer. Many bad impressions will be avoided and many more sales will be made if competent and trained salesmen are used. Another important group of men are those who install units. These men must know their business because the first essential to successful refrigeration operation is a correct installation. Instance after instance of unsatisfactory service may be traced to the lack of proper precaution in this highly important matter.

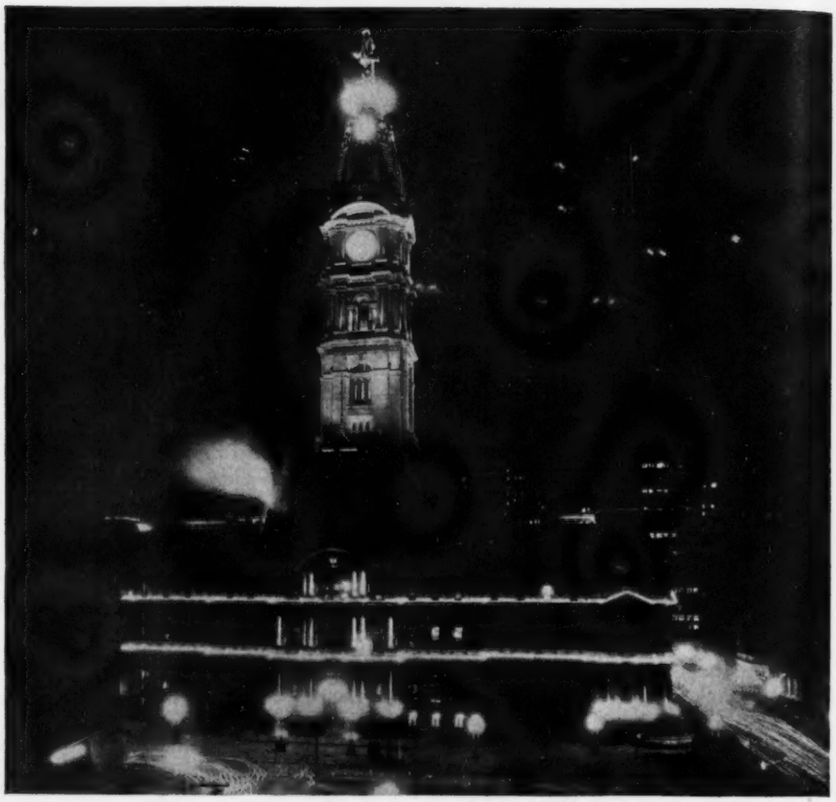
All refrigerators require servicing in some measure, and men to do this work must be trained mechanics who have specialized for some time on refrigerators. This practice makes for quick service, lower costs per customer and more service calls per man per hour. An ill-trained service man produces in the mind of a home owner the same reaction that is caused by an ill-trained plumber.

The survey shows clearly that in every case where trained men have been used and where brains have been devoted to building an organization for refrigerator sales and service an outstanding service and financial success has been had. The case for domestic electric refrigeration is proved, but, as in any business, success requires skill, industry and brains.

# Floodlighting Philadelphia Civic Buildings

IN CONNECTION with the Sesqui-Centennial Exposition the arrangements made for floodlighting two of Philadelphia's famous buildings are of interest. Both the City Hall, with its 511-ft. tower surmounted by a 37-ft. statue of William Penn, and the world-famous Independence Hall are now illuminated in the most modern way.

Particular care was taken to bring out the architectural beauty of both buildings by the use of searchlights, strip lighting and floodlighting in a way which diffuses the illumination and eliminates objectionable shadows.



At right—The light on the City Hall tower shades from white at the 9-ft. brim of William Penn's hat to pink and into red at the base. The lighting load is approximately 700 kw.

Below—Independence Hall was floodlighted under the direction of the engineers of the Electric Service Supplies Company, using "Golden Glow" equipment.

# Construction of an 80,000-Kw. Generator

## Design Details of a Cross-Compound Base-Load Turbo-Generator to Be Installed by the Brooklyn Edison Company in the Hudson Avenue Station

By J. R. TAYLOR
*Power Engineering Department, Westinghouse Electric & Manufacturing Company*

DURING the year 1925 the Westinghouse Electric & Manufacturing Company started construction for the Brooklyn Edison Company of an 80,000-kw. 90 per cent power factor cross-compound turbo-generator set. The Brooklyn Edison Company's base load had increased to such extent that a base load machine of exceptional size was required to meet the demand. A cross-compound unit was selected because with this design more kilowatt capacity could be installed in the available space. According to the terms of the contract, each generator of the set is to be able to deliver 44,450 kva. of three-phase energy at 90 per cent power factor at 13,800 volts and 60 cycles when direct connected to a 40,000-kw. steam turbine at 1,800 r.p.m.

The rotor body of each of these generators consists of a number of hot-rolled carbon-steel plates held together and fastened to the shaft ends by means of four alloy-steel bolts located one in each pole center. Each of these bolts is a forging accurately machined, inserted in the plates and pulled up to a known tensile stress by means of nuts.

On account of the radial slots in which the field coils are wound it is necessary to increase the pitch of each successive turn as the winding of a coil in any given pair of slots progresses. The field windings are form wound by machine. They are necessarily hand wound in the slots because of the variable pitch. Each successive turn in the slot is insulated by means of a mica strip, and the straight part of the wound coil in the rotor body lies in a mica cell. After the operation of building the field coils is completed the coil ends are thoroughly varnished. Each coil is pressed and held for several days at a temperature considerably higher than that at which the unit normally operates, by means of set screws in rings that surround the rotor body, in order to drive off all the volatile parts of the insulation bond and the varnish solvent. This is brought out very clearly in Fig. 2, which shows the longitudinal elevation of a 44,450-kva. turbo-generator.

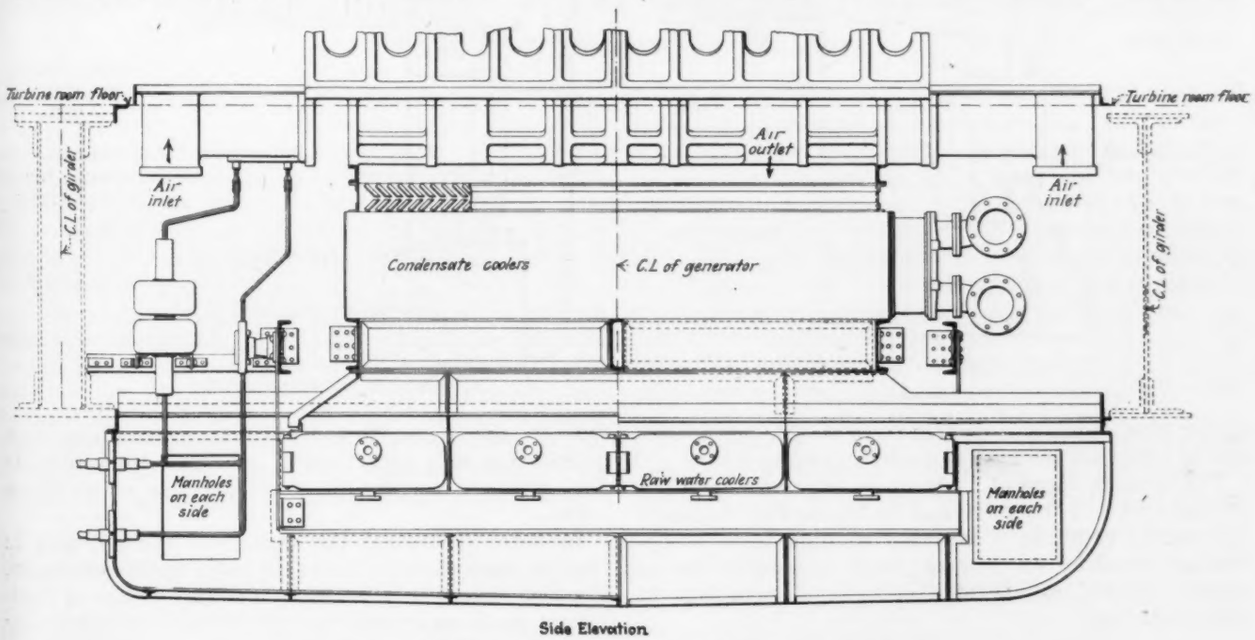



FIG. 1—COOLER ARRANGEMENT OF HIGH-PRESSURE GENERATOR

One of the most difficult problems encountered in constructing a highly stressed body of component parts such as the turbo-generator rotor shown in Fig. 4 is that of retaining the end windings against the action of centrifugal force and at the same time making provision for the repeated relative expansion and contraction of the rotor body with varying temperature conditions while the winding insulation and rotor balance are maintained. No radical departures from usual turbine practice were made in securing the rotor windings. In the rotor body the windings are held in the radial slots by means of bronze wedges, whereas on the

ends they are supported by means of insulated steel retaining rings. The retaining rings are made of chrome-nickel steel having an ultimate strength of 100,000 lb. per square inch, with an elongation of 22 per cent. The rotor end plate is made of hot-rolled carbon steel having an ultimate strength of 65,000 lb. per square inch. The fans are supported from the rotor end plate by means of suitable studs. The blades are of the regular straight inclined blade centrifugal type. Both the rings and blades are made of chrome-nickel steel. In conjunction with the shaft end, the end plate is fixed in position by means of a lock nut on the shaft. Holes are machined in the end plates in order to allow air to enter the rotor and cool the end windings and rotor body. Air ducts are milled beneath the winding slots in the rotor body below the field coils. These axial ducts in turn connect with radial paths spaced axially along the rotor body consistent with the structural conditions of the rotor. The collector is of the insulated spacer type, hence it is as free from trouble due to dirt and oil accumulation as it is possible to make it.

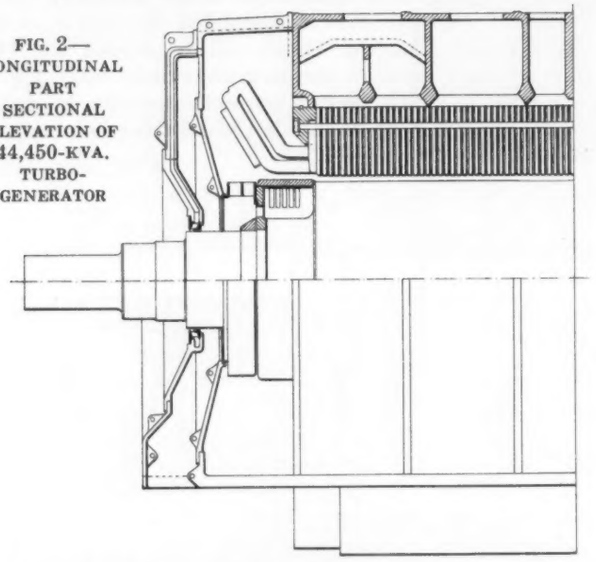


FIG. 2—LONGITUDINAL PART SECTIONAL ELEVATION OF 44,450-KVA. TURBO-GENERATOR

The running speed of 1,800 r.p.m. is greater than the critical speed of the rotor and its supporting members and should result in a smoothly running rotor at operating speeds. As one of these generator rotors weighs 101,000 lb., it offered a sizable problem in transportation.

### FRAME IN TWO SECTIONS

The stators are of such proportions that they could not be transported if the laminations were stacked and the windings connected at the works. The frame is split in two sections at right angles to the axis of the rotor. Fig. 5 shows a casting for half of a frame. Each half is a complete annular casting bolted to the other to form the frame. The laminations were stacked and the coils wound and connected at the Hudson Avenue station. The stator core is composed of laminations of the usual thickness. These laminations are held in position by the double means of dovetails slotted in ribs cast in the frame and by compression under end plates and finger plates pulled tight by the necessary insulated through bolts. After the stator laminations are built but before they are pulled up to the required tightness the stator core is thoroughly sprayed with an insulating varnish with a view to maintaining the core tight.

The stator windings are formed of diamond-type coils. From tip to tip in the direction of the straight part the coils are 180 in. long; they weigh 175 lb. each. Every individual strand of these formed coils is insulated with mica tape and the completed coil is incased in a micarta folium wrapper pressed and wrapped by the Haefly process. After the coils have been repeatedly vacuum impregnated with insulating gum and finished pressed there are no trapped air pockets or weak dielectric spots. By the terms of the specifications the completed winding was given a potential test to ground of 40,000 volts for one minute. The end connections are of the involute form. In order to equalize generated voltages and reduce eddy current loss, the strands of a coil are transposed depthwise in successive slots so that the strands in any phase group have occupied all possible positions in depth in the slot by the time the phase group is traversed. A complete system of coil supports and intricate blocking is used with a view to supporting the end windings against any short circuit that may occur and at the same time allowing free access of cooling air to all parts in which losses occur.

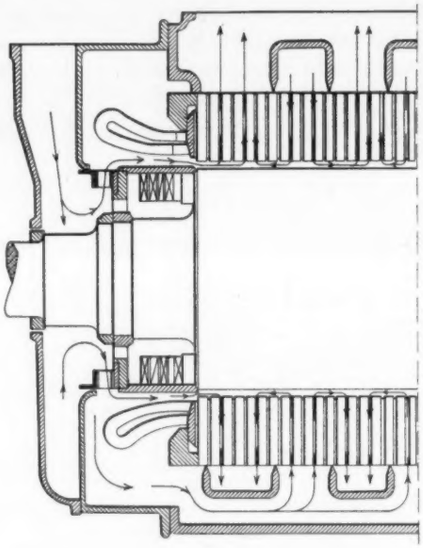


FIG. 3—MULTIPLE-PATH RADIAL TURBO-GENERATOR VENTILATION

In turbo-generators the losses are concentrated in smaller space than the losses in lower-speed generators. For that reason it is necessary that the means of dissipating these losses from the small space in which they are generated be most effective. A modification of the much older system of radial ventilation known as the multiple[1] path radial system was applied to these generators as shown in Fig. 3. In the simple radial system all the air for cooling purposes is forced to enter from the ends of the machine and travel axially in the air gap in order to escape radially through the vent ducts between packages of stator laminations to cored passages in the back of the frame. The multiple-path radial system of ventilation differs from the simple radial system in that air is forced by pressure built up by the rotor fans to flow across the back of the packages of stator laminations axially and through the vent spaces between packages of stator laminations radially in order to reach the air gap. In the air gap the air

[1]Test results and mathematical analysis of air flow have been described in the following papers: C. J. Fechheimer, "An Experimental Study of Ventilation in Turbo-Generators," A.I.E.E. *Journal*, May, 1924; D. Bratt, "The Multiple Radial System of Cooling Large Turbo-Generators," A.I.E.E. *Journal*, March, 1924; M. D. Ross, "The Multiple Path Radial Ventilation of Large Turbo-Alternators," *Electric Journal*, December, 1924.

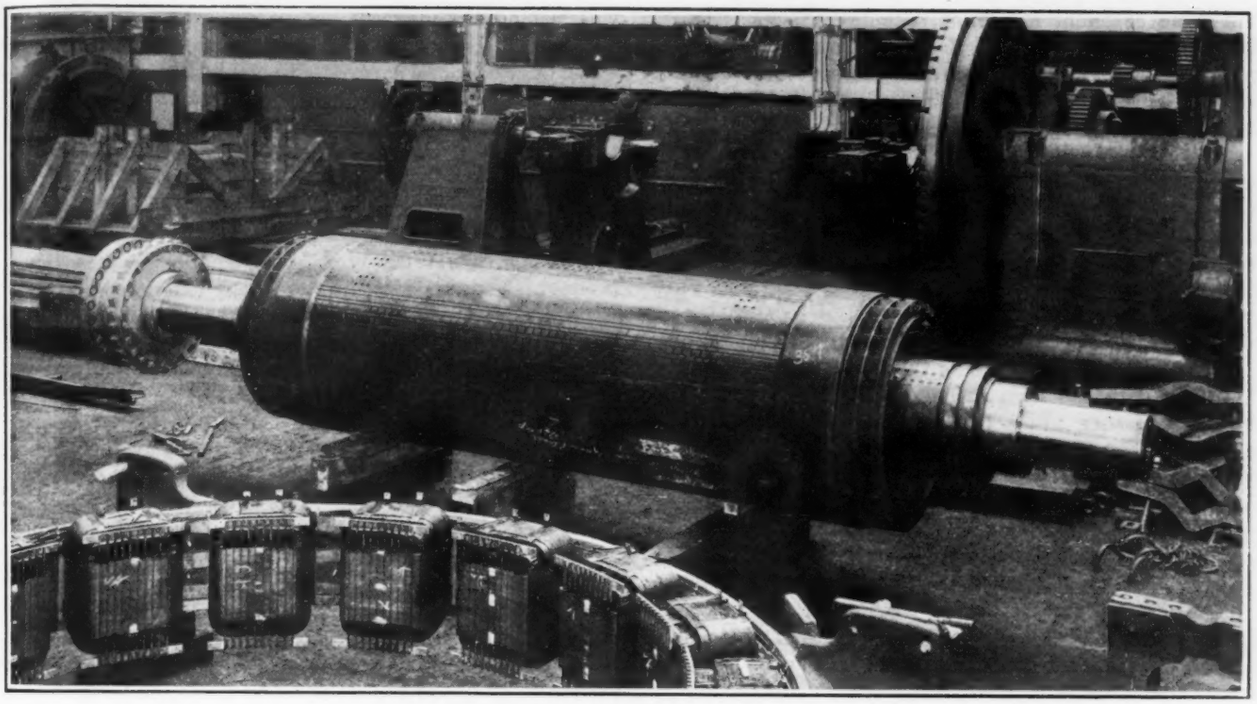


FIG. 4—ROTOR OF TURBO-GENERATOR IN THE SHOP

moves along the rotor body and the stator tooth tips axially in order to reach the radial outlet vent ducts between packages of stator laminations. The hot air from the radial vent spaces is discharged to the cored outlet passages in the frame, as shown in Fig. 5. Air is also forced in from the ends of the rotor as in the simple radial system in order to keep the end packages of laminations cool.

A closed circulation system of ventilation is used in which the cooling air is recirculated through each unit and cooled by means of water-tube coolers. The cooler arrangement is of unusual design. There are two banks of coolers in series with the air stream for each generator, set with their major axes at right angles to each other. The upper bank uses the turbine condensate for the absorbing medium, and with the unit operating at full load is able to maintain the temperature of the circulating air below 40 deg. C. The lower bank uses raw river water to absorb the generator losses from the cooling air. They are of sufficient capacity to maintain the air temperature below 40 deg. C. when used as auxiliary to the condensate coolers at light load when the volume of condensate becomes insufficient or when the temperature of the condensate makes it unsatisfactory for absorption purposes. Between the condensate element and the generator a series of baffles are placed. These baffles are for the purpose of preventing any water from a cracked tube or joint squirting into the generator stator through the outlet air opening. A closed circulation ventilating system of this type is a positive aid in keeping the generator clean, because it uses the same air in repetitive cycle,

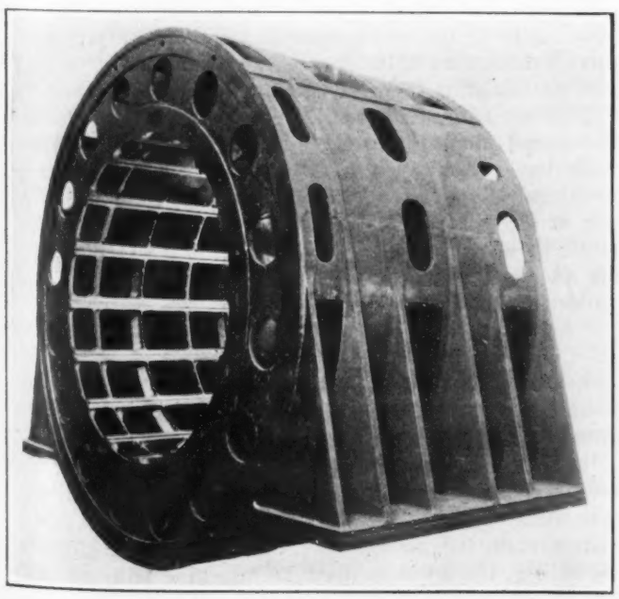


FIG. 5—CASTING FOR HALF OF FRAME

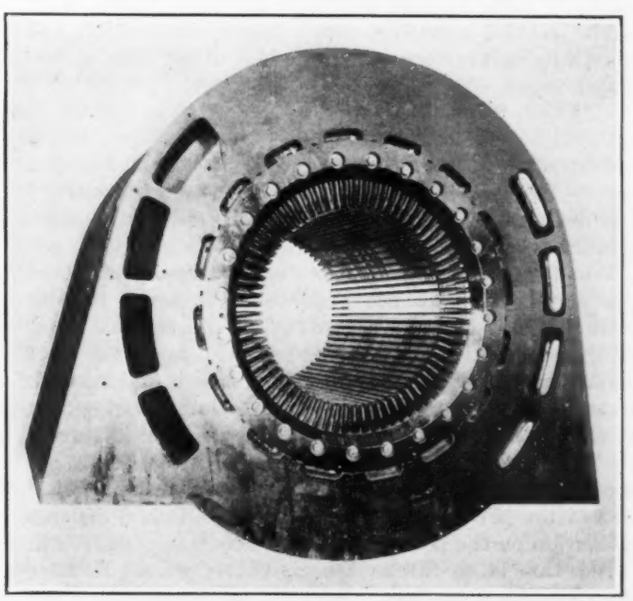


FIG. 6—FRAME CASTING READY FOR WINDING

and is an excellent means of reducing the fire hazard, because the small amount of air and consequently oxygen contained in the system can support only limited combustion. The general arrangement of the air coolers is shown in Fig. 1.

A complete system of protection against grounds or defects in coil insulation in the generator is installed on both units. Nine leads are brought out on each generator. The ends of the three phases are connected together to form the neutral outside the generator. The main leads from the generator have relays that are balanced against those installed on the step-up transformers to protect station equipment against grounds.

As far as operation of this two-unit set is concerned the direct aim has been to have the high-pressure and the low-pressure units function together as a single machine. The division of load is dependent upon the steam conditions at the throttles of the respective turbines. The field current in the two machines is kept equal at any given load by means of two duplicate mechanically locked rheostats.

The calculated efficiency of each of these generators is 96.6 per cent at full load of 40,000 kw., 90 per cent power factor and 13,800 volts. To date no efficiency tests have been made, so no test data on losses or temperatures are available for publication.

# Domestic Refrigeration and the Ice Company Load

## A Frank Discussion of the Obligation, the Opportunity and the Economics of the Situation—The Answer to the Problem Anywhere

By G. M. Dwelley
Sales Manager Kelvinator Corporation, Detroit

WHAT should a public service company do that serves several large ice companies on a friendly basis and at the same time wants to start merchandising domestic electric refrigeration? What should this same company do when, having decided to merchandise the small machine, the ice company protests long and loudly? Here are two awkward questions which every public service executive must answer eventually, and constitute a problem which divides itself into a few major items.

### Obligation to Ice Company

Just what did the ice company start up in business for? To create revenue for the power company? Decidedly not. It started to serve the public and make a profit for itself in the process.

Would the ice company have started in business had the power company not been there to serve it with power? This depends somewhat on the relative dates of their inception. Either the ice company did start before the power company, in which case it started with steam and was later turned over to electric equipment at the solicitation of the power company, or it started up with power company energy. In either case, its present power equipment investment was at the solicitation of the power company, and there is thus a distinct obligation on the power company to continue to serve it.

But this is as far as the obligation goes. Reverse the situation a moment. Why did the ice company put in electrical equipment in the first place? Because it was demonstrated to it that electricity was cheaper, more flexible and better in every way than the steam water power or whatever other method it had been using up to that time. If this were not so, it would have continued to use its old methods, just as it would have continued to rely on natural outdoor freezing of ponds had not artificial ice-making machinery been better. Thus for years it has been making more money by the use of electricity and the power company owes it nothing except the continuous supply of this same product. Suppose some new company should come along with a Diesel engine hook-up that would furnish the power it needed cheaper and better than the power company could possibly do it. What would happen? The power company would lose the account just as fast as the new equipment could be installed. Neither sentiment nor long association would or should stop it. Thus the power company owes the ice company no obligation except that of continuous service, and regardless of its own activities will continue to hold the account as long as its own service is better and cheaper than any other method—and no longer.

### Obligation to Mass Customers

After all, the power company is a public service company and owns its franchises and its right to do business because of the votes and the acquiescence of that public which it serves. If publicly owned, this same public is customer, franchise grantee and owner. In which direction does the major obligation of the power company lie? Which has the greater number of individuals? Which has the more votes, and thus a greater franchise granting power? Which owns the larger portion of the power company itself?

The greatest good for the greatest number must prevail. Thus from every angle the power company owes its first obligation to the public, not to the ice company. The power company is the producer and distributor of electricity for its community. Its justification economically is in the use of its product. It is fulfilling its duty to the public to the utmost only when it induces that public to use to the utmost everything consuming electricity which will add to the public's ease, comfort, convenience, health and economy.

Suppose the broom manufacturers had protested so vehemently to the power companies that the latter in a panic discontinued the sale of vacuum cleaners. Would that be fulfilling their obligation to the public and to civilization and advancement in general? Suppose the washboard manufacturers and the public laundries made the power companies quit the sale of washing machines. Suppose the coal mines made them quit the sale of electric ranges, toasters, percolators, etc. The public laundry versus the washing machine is incidentally an exact analogy with the ice company versus the domestic electric refrigerator.

### Obligations to Stockholders

A simple duty rests upon the power company to make the largest dividends possible for those who have invested in its securities.

It must be considered, therefore, that whereas an average ice company will consume 1,250,000 kw.-hr. per year at an average rate of 1½ cents per kilowatt-hour, with a resulting annual revenue of around $18,750 to the utility, the average domestic machine will consume 600 kw.-hr. per year at an average rate of 5 cents per kilowatt-hour. Thus it will take only 625 electric re-

frigerators in operation in customers' homes, stores and offices to equal the annual revenue of the ice company. Is there any one to question the fact that more money can be made out of adding 375,000 kw.-hr. to the loads of 625 customers, on whom the capital investment has already been made and for whom the operating expense (meter reading, billing, etc.) is already being maintained, than can be made in furnishing 1,250,000 kw.-hr. to one company?

Especially is this true when one considers that the domestic load is a 24-hour one, practically all off peak, and that the peak demand load for 375,000 kw.-hr. of domestic load is inevitably much less than the peak demand load for 1,250,000 kw.-hr. furnished one customer.

It is true that in most territories the annual revenue from the ice company is still greater than that from all small refrigeration machines combined, but every month domestic refrigeration is catching and passing the annual revenue of more ice companies and this process is continuous and accelerating.

### Economics of the Situation

The ice industry is not going to quit business just because small refrigeration has started in its territory. American business men are not built that way. They are going to fight, and fight hard, for more business. In this process they will bring into the fold millions of families that are not now using ice at all, and as the small refrigeration companies lop off users from the top of their list they will add as many or more at the bottom. This process has already started and through their association, and locally and individually the ice companies are prosecuting a vigorous campaign to sell the public the refrigeration idea, which is, incidentally, exectly what the small machine manufacturers are doing. This means to the power company that the revenue from the ice company is going to continue in undiminished volume for years to come and that there will be added to this revenue that of the small refrigeration industry.

Suppose now that in spite of all these facts the opposition of the ice company succeeds in keeping the power company out of merchandising the machine. The only essential difference is that the power company will be cut out of a large and rapidly growing merchandising activity and that its revenue will suffer by the fact that in all probability the small machines will get a later start and be sold in somewhat smaller volume.

### The Hardest Decision

The one executive in the power industry who is up against it is he whose company owns ice companies. That executive has a hard decision to make. He is in the position of the livery stable owner of 1905. And yet his decision may be made easier if he will look at history and contemporary action. Where is the livery stable owner of 1905? What is he doing? Is he broke? Not at all! He's doing business at the same old stand, and is more prosperous than ever—running a garage. So much for history.

Many ice companies are now selling the domestic refrigerator in their own territories and more will be doing so. It would be excessively awkward for a power company executive, would it not, to explain the fact that the ice company had kept him out of the business until all the really good merchandising propositions were gone, only then to change his front and sell a machine of his own? If it is good business for the ice company to get into the selling of the small machine, how much better is it for the power company owning an ice company. The former will make a profit either on the ice or on the machine, but the latter has the additional and biggest profit of all—the continuous revenue on the power for the life of the machine.

Thus, to sum up, the power company has no obligation to the ice company to stay out of the industry, and has a distinct obligation to its customers and to its own balance sheets to get into it. Whether it gets into it or not, the effect on the ice company will be the same, but the effect on the power company may be a loss of possible revenue.

# Guadalajara Hydro-Electric Development

## American-Owned System in Second Largest Mexican City Has 1,900-Ft. Head and Possible Rating of 30,000 Hp. or More

By W. D. Hornaday

ONE of the largest industrial transactions that have taken place in Mexico for several years was the purchase several months ago of the electric and rapid transit holdings of the Compañia Electrica Chapala of Guadalajara by R. W. Morrison of San Antonio.

WATERFALL IN EL SALTO, GUADALAJARA

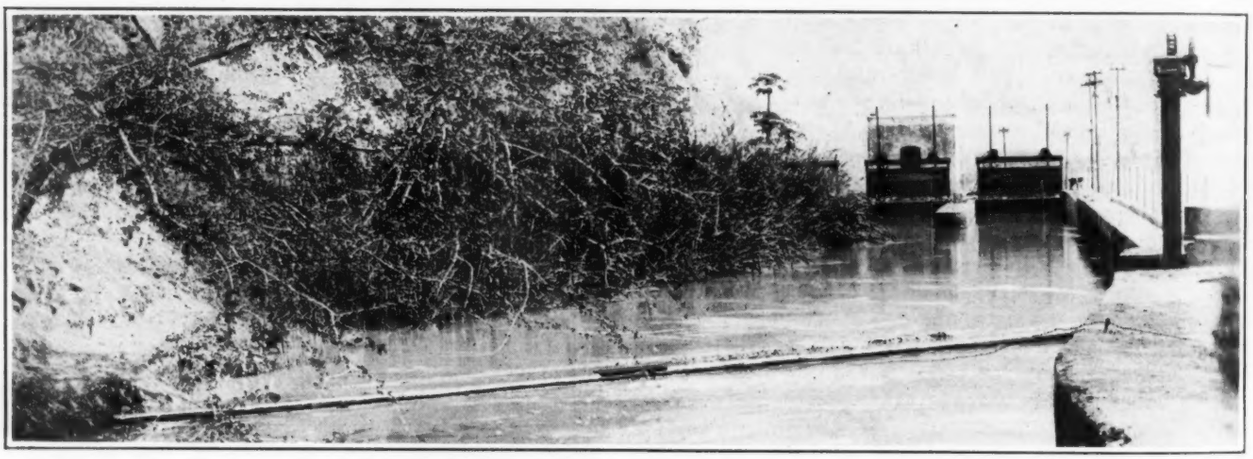
Guadalajara, with a population of 140,000, is the second largest city in Mexico. It is situated 6,100 ft. above sea level and is a handsome, well-kept place. The Compañia Electrica Chapala was controlled by the the Banco Nacional of Mexico City, and it was from this financial institution that Mr. Morrison acquired the properties. He has announced that he is at this time organizing a corporation which will be called the American Utilities Company, to be incorporated under the laws of Delaware for the purpose of taking over the properties of the Compañia Electrica Chapala and two large ice manufacturing plants in Texas owned by Mr. Morrison.

The more important holdings of the Guadalajara utility company consist of three hydro-electric plants, all situated on the Santiago River, about 300 miles of transmission and distributing lines, and the electric tramway system in the city and its suburbs, embracing 45 miles of main tracks. The hydro-electric plants have a total capacity of 30,000 hp. The largest of these plants is situated at the falls of El Salto, about

12 miles from Guadalajara. One of the other plants is located at Puente Grande and the third at Las Juntas.

"During the current year I plan to spend between $750,000 and $1,000,000 in enlarging and improving these electrical properties," Mr. Morrison said recently to the writer. "Additional equipment will be immediately installed in the plant at Puente Grande, which will increase its capacity 8,000 hp., thus bringing the total available electrical energy up to 38,000 hp. The power transmission system of the Compañia Electrica Chapala will be extended to connect with the power plants of the Guanajuato Light & Power Company, which is closely allied with the Central Mexico Light & Power Company. Ultimately the power transmission system of the Mexican Light & Power Company of Necaxa and Mexico City may be connected and become a part of this extensive power distributing system."

Mr. Morrison expressed the belief that the electrical power development of the Santiago River has possibilities second only to that of Niagara Falls. This stream has its source in Lake Chapala, which is the largest inland body of water in Mexico, being 70 miles long by 20 miles wide. The lake is fed by the Lerma River.



PENSTOCK GATES LAS JUNTAS INTAKE

The Falls of Juanacatlan on the Santiago River are called the Niagara of Mexico. The horseshoe fall measures 242 ft. from tip to tip and the descent of the water is 70 ft. The volume of the flow varies with the season. The Santiago River is known locally as the Rio Grande. Its course after leaving Lake Chapala is through a mountain region that possesses scenic attractions equal to any in Mexico. The river empties into the Pacific Ocean near the port of San Blas.

"From a dam at the point where the Santiago River leaves Lake Chapala to a point 20 miles below the fall is 1,900 ft.," Mr. Morrison said. "One meter drawn off of the lake with its total available head development would give 100,000 hp. continuously for a year. Add to this storage of three or four meters and the available horsepower would be increased to 300,000 hp. or 400,000 hp."

Considering the high price of fuel in southwestern Mexico, it should be possible to distribute electric power economically a distance of 300 miles, according to Mr. Morrison. Within that radius are many important mining districts where low-grade ore properties cannot now be successfully worked because of high fuel costs, as well as a number of cities and towns of considerable size with splendid future prospects. Within the range of the proposed power system would come such cities as Manzanillo, Colima, Tepic and scores of smaller communities. With cheap electric power available the mining industry of a large scope of the Sierra Madre region would be transformed and made prosperous in the same manner that has already been done in such mining districts as Guanajuato, El Oro, Parral and others where electric power is available. The largest customer of the Compañia Electrica Chapala at this time is the Compañia Cinco Minas, an American company which uses 6,000 hp. at its mines, 60 miles northwest of Guadalajara. Constructing high-tension lines through the mountains of the State of Jalisco and to points outside its border is much more than an ordinary task because the mountains are crisscrossed by deep and almost impassable barrancas or gorges.

"I am convinced that the near future will witness great strides of agricultural and general industrial development all through the Pacific coast region of Mexico," said Mr. Morrison. "The early completion of the Southern Pacific Railroad of Mexico to a connection with the National Railways of Mexico at a point just west of Guadalajara will bring about a veritable revolution in the business relations between the coastal region and the interior parts of that country."

Mr. Morrison expressed himself as especially proud of the fact that the company operates extensive shops where it rebuilds its transformers and that all of this work is done by Mexicans. These native laborers have proved themselves to be the equal of men of any other race in the matter of highly technical or skilled labor, he asserted.

Mr. Morrison has great faith in the future of Mexico as a field for American investments. "I think my investment in Mexico just as safe as any investment that I have in the United States," he said. "Men who go to that country and put their money into industries in a practical way and use common sense in their methods of doing business are now receiving and will continue to receive far greater profits from their investments than they could possibly hope to obtain on investments in the United States. There is not a manufacturing enterprise in Guadalajara that is not making double the ordinary interest rates on its investment."

E. J. Puig, who was formerly manager of the electric light and power plant at Laredo, Tex., is president and general manager of the Compañia Electrica Chapala.

# A Lighting Service Department

## How It Was Formed for a Central-Station Syndicate—What Has Been Accomplished—Duties of Department Personnel—Use of Campaign Methods

By J. M. SHUTE
*Illuminating Engineer Central Illinois Light Company, Peoria, Ill.*

NEXT to food, water and air, light is the most important boon to mankind. The problem of producing light artificially to overcome darkness is as old as the human race, yet the number of people is very few who realize how our health and happiness depend on the skill in manufacturing and utilizing artificial light. Until very lately few of the central stations that furnish the greater portion of that artificial light realized how important it is that their customers in general know how to get the most from the light they are buying. It required years of consistent and untiring effort on the part of manufacturers of lighting equipment and lamps to prove that the duty of educating these customers belonged to the central stations, as they were in direct contact and could derive the most benefit from a lighting service department.

### Reasons for Lighting Service

Although the relations of our great public utilities to all phases of modern life may seem complex, the fundamental basis of these relations is service. Certain of our public utilities supply a finished product in the form of service, but the central station supplies a product that is of no value to mankind unless translated into light, heat or power to meet the public demands. In fact, the entire central-station industry was built upon the demand for artificial light as a complement to natural light and upon the fact that electricity could be transformed into a form of artificial lighting to meet that demand.

The central station found that to market its products it was necessary to sell service with the electric current in order that existing demands might be satisfactorily filled and new demands created. Such service furnished by the central station through the formation of a lighting service department has three main advantages:

1. Increased good-will on the part of lighting customers.

2. Increased activities and co-operation on the part of local electric dealers, causing increased sale of lighting equipment.

3. Increased lighting load, resulting in increased annual revenue.

All work done by the lighting service department that helps the central station in any way will fall under one or more of these classifications. It should be the duty of the head of such a department to be at all times on the lookout for new ideas and methods by which one or more of these ends may be accomplished. One successful plan naturally leads to another, and often, by minor changes, plans used for one phase of lighting work can easily be adapted to others.

The ball has begun to roll and is rapidly gathering more momentum. Each year more central stations ask the question, "How can we form a lighting service department and what will it do for us?" This two-headed question can be answered in the same way, whether it comes from Maine or California, by saying, "Form a department that gives lighting advice of the correct sort to customers and watch the good-will improve and the revenue increase."

### Laying the Foundation

To establish such a department requires considerable study, and though in general it will be the same for any central station, conditions found in a property serving one large city of several hundred thousand inhabitants will necessitate a slightly different procedure from that of a company serving a large number of smaller communities spread over a relatively large territory. As the experience of the writer has been confined more closely to properties of the latter type, this article will deal with the formation of a department functioning under such conditions.

The department the formation of which will be discussed in this article is one operating for four central stations, each serving a city of between 60,000 and 100,000 inhabitants, together with a number of small communities located within a radius of approximately thirty miles of the central point of distribution. In this case each of the four companies is operated with separate local management and policy control, and specialists are assigned by the syndicate management to give advice and assistance along their various lines to all the member companies. In this way the lighting work is handled in a slightly different manner from what it would be if the syndicate were managed from one office and merely divided into districts. In the case under discussion all local lighting engineers come under direct control of the local managers and the district illuminating engineer plans work and gives advice to local representatives when necessary. The disadvantage of such a system is that more company representatives must be sold on a given idea than when all lighting men function directly under the illuminating engineer.

The actual formation of the lighting service department requires the man in charge of this work to be well grounded in the fundamentals of illuminating engineering, to be familiar with lighting sales work, lighting educational work, departmental management and, if possible, public speaking, and writing for publication. By placing a man with these qualities in charge, it will be found that all phases of the work will be given due attention. Lighting campaigns will be conducted during the seasons best adapted to each particular phase of lighting, and educational work will be carried on in the manner to produce the best results.

The first duty of the illuminating engineer is completely to sell the management of each local property on lighting service. This point is extremely important if the department is to function efficiently without interference. It will be found that where lighting departments are to be started there is a great deal of information to be furnished due to lack of past consideration of lighting work. Although the average lighting load for the country has been figured to be 36 per cent of the total and gives approximately 60 per cent of the total revenue, this load has been allowed apparently to run wild in the past. The central station has been careful to maintain a power engineer at all times, but until lately there has been little importance attached to the cultivation of the lighting load. As a result it has been found that in one property of the syndicate under discussion the lighting load was only 28 per cent of the total, a fact that gave the new lighting department an excellent opportunity to prove its value immediately.

Several methods have been found successful to sell the local manager on the opportunity afforded for lighting service work among the customers in which he is interested. Some managers already half convinced can be won over by mere statistics on results obtained in other properties in various parts of the country. In other cases it may be necessary for the illuminating engineer to make a hurried survey of the community and then, from the information gathered, together with the lighting data, with which he will be familiar, point out to the local management just what work can be done and what results gained in the particular community under consideration, basing these results on past experiences in other communities. A third method that has been used with success in convincing even the most doubting management is to carry on a concentrated effort on one property where the management is favorable and at the end of a year to compile a report showing the results obtained. Such a report compiled from actual work by an adjacent office under the same syndicate will carry great weight with the most unconvinced manager, because it covers results obtained in his own company.

### Training the Personnel

As soon as a local management has been convinced of the advisability of lighting service work as a part of the company duties, a suitable man to handle it should be obtained. Local conditions should govern the choice to a great extent. In most cases it will be preferable to transfer to this work a young, energetic employee who is familiar with the policies of the company. If such a man is not available for transfer, a young man of the necessary qualities should be hired. A local man is preferable in either case, as he has the advantage of familiarity with local conditions and thus brings quicker results. The local lighting service engineer should be of pleasing personality, should be able to talk easily and convincingly with customers and should have some knowledge of electricity, if not of lighting.

His first duties should be to begin a study of illumination, learning its fundamental principles, its applications and its results. He should study lamps and lighting equipment to become familiar with all types and their applications. He should study local conditions and become familiar with systems that are not giving proper service and should learn the important sales points for later use.

To give the local lighting engineer the proper training the illuminating engineer should prescribe a course of study, provide necessary books and give all possible assistance in making him familiar with all phases of lighting work. If possible, periodic examinations on various questions concerning lighting should be given to show what points have been grasped and which ones need more study. If possible the local lighting engineer should be enrolled for national courses of study, similar to those given by the N.E.L.A. or by schools similar to those conducted by prominent lamp or lighting equipment manufacturers.

As soon as the local lighting engineer has become somewhat familiar with the subject of lighting he should be allowed to handle the more simple problems arising in connection with the work. Nothing will furnish better experience and a greater confidence in his own abilities than to be obliged to rely on his own resources and to put into practice in actual work the knowledge he is gaining in the subject. At this stage of training the illuminating engineer should check all work carefully, point out mistakes and make careful explanations of the corrections. Extreme care should be taken to prevent harsh criticism of errors at this time, as in many cases such a course has been known to cause loss of confidence and lack of initiative in attacking problems that otherwise would have been handled in a successful manner.

### Planning Lighting Service Work

After the local lighting engineer has been trained to the extent that he is able to handle the average problems that will arise in his property, more time can be given by the illuminating engineer to other properties that are less advanced in the work, or to other duties. However, close contact among all local lighting engineers and the illuminating engineer should be maintained and all complicated or extraordinary problems should be referred to the illuminating engineer for solution. In such cases the local lighting engineer should make a careful study of the solution to the problem in order that future problems of a similar nature may be solved satisfactorily without assistance from outside.

In the case of a lighting service department functioning in a manner similar to the one under discussion, the local lighting engineer will actually be under the supervision of the local new-business department manager. It is therefore highly essential that the latter be in accord with the plans and ideas of the illuminating engineer in order that there will be no friction to disrupt the workings of the lighting service department. To obtain the proper co-operation and harmony, the local new-business manager should be advised of all new plans sufficiently far in advance to make all necessary preparations for their successful operation. An excellent method to follow is for the illuminating engineer to work out with each local new-business manager a schedule of operations to be carried on over a period of a year and then allow him to exercise general supervision over their actual execution.

It will undoubtedly be found that at the start the local lighting service department will find it difficult to keep busy and will be obliged to look about very carefully for customers to serve. Such a situation should not cause discouragement, as before long there will be all the work that can be handled. It takes some time for customers to realize the service that is being

offered to them, but as soon as the service begins to gain recognition the demands on the lighting service department will rapidly increase.

### DEVELOPING THE DEPARTMENT

There is a diversity of opinion as to the number of customers that can be served adequately by one engineer. However, it is the opinion of the writer that any community or group of communities of from 25,000 to 30,000 inhabitants can give one local lighting engineer all the work he can possibly take care of, if the proper energy is applied. A property of this size will furnish from 5,000 to 6,000 customers to serve, because every electric meter, in no matter what category, furnishes a potential customer for lighting service. The local lighting engineer with such a property will be able to gain a very diversified experience in lighting work and has the opportunity of developing into a very valuable asset to the company.

In the case of larger properties, the lighting service department should be increased as rapidly as there is a demand for increased service. A company serving from 100,000 to 150,000 inhabitants will find that there is sufficient work to require the services of three local engineers after two years of operation if the entire lighting field is to be adequately covered. A good distribution of the work in this case would be one engineer for residences, hotels, schools and public buildings; one for industrial work, sign lighting, street lighting and floodlighting, and one for store, show window and office lighting.

After four years of operation this same company could easily afford a lighting service department consisting of five engineers, whose work could be distributed as follows: One for street lighting, floodlighting, sign lighting and special lighting; one for residence and hotel lighting; one for store, show window and office lighting; one for church, school and public building lighting; one for survey, sales promotion, and contact work with architects, builders and contractors.

Such a department may seem excessive in size to a central station, but from past experience it is the belief of the writer that, if properly managed, a department of this size could easily prove its value to a property of the size mentioned. It should be borne in mind that lighting work, from a psychological standpoint, is seasonable to a great extent. For this reason one or more of the engineers engaged in the work as listed above would be at all times available to assist in campaigns or other excessive demands in one of the other fields of lighting.

### EFFECTS OF LIGHTING SERVICE

The preceding portion of this article has dealt with the formation of a lighting service department for a central station; however, it seems hardly fair to conclude without mentioning the results obtained by such a department. To show these it is best to recall the three reasons first laid down for the formation of such a department and to see the effect that has been obtained by putting these three principles into practice.

Satisfied customers are of great assistance to the successful operation of a central station. Friendly relations with the public mean less work on the part of complaint and commercial departments and less antagonism toward new projects of the company. Confidence in the policy of the public utility always results in greater revenue to the company, due to wider use of its product.

This confidence in the central station can be maintained only by furnishing service to the public. Lighting service is extremely effective, because it is most noticeable to customers. Such service can be rendered in many ways:

1. Advice to residence customers on the proper lamps and fixtures needed to add to the beauty of the home.
2. Campaigns that bring into wider use better lighting equipment in the home.
3. The display of model homes.
4. General advice to customers with view to changing lighting systems to furnish more and better light with lower current consumption.
5. Advice to customers resulting in the use of more light and current with a view to increasing their business.
6. Changing of customers to rates more advantageous to them.

The general effect of the formation of a lighting service department on other electric interests is a gradual stimulation in the lighting field, a more widespread knowledge of the value of proper lighting, closer co-operation with the central station in carrying out its plans, and increased sales of electric equipment. Thus again the service leads to the establishment of increased good-will toward the central station, this time through indirect means.

No central station can be so altruistic in its plans as to operate a department that will not pay for itself in some way. In the case of the lighting service department, even though increased good-will may be its primary object, it must still in some other way show a profit to the company. This is not difficult to do, as the great majority of the customers advised by such a department are those who in the end increase their load.

From experience it has been shown that one of the best methods is a program of lighting campaigns so laid out that the campaigns follow one another at the times of the year best adapted to their successful operation. Such a system can be repeated year after year, because there are at all times new prospects in each phase of the lighting field. The various campaigns can either overlap or one be discontinued several weeks before the next is to begin. All such details depend on local conditions and the scope of the market for that one particular type of lighting during a given year. Periods between lighting campaigns at all times can be utilized profitably for house-wiring solicitation, special campaigns, educational work, street lighting and many other similar interests that are of benefit to the central station.

In order to show definitely what can be accomplished by a lighting service department similar to the one under discussion, the results of one year's work will be given. During that year in the four properties lighting service was furnished to 2,400 residence customers, 250 commercial customers and 25 industrial customers. At the same time 180 customers were induced to purchase electric signs, 15 street lighting and 4 park lighting installations were made, 30 public building and other special lighting installations were added and 20 new lighting installations were made on company properties. During the same period lighting talks were delivered to a total of more than 5,000 persons.

This service work resulted in the addition of 375 kw. of new lighting load, adding an estimated annual revenue of $30,000, and required the sale of approximately $42,000 worth of lighting equipment in one property.

For the four properties there was a total of approximately 725 kw. of new lighting load added, resulting in additional estimated annual revenue of $58,000. This work was accomplished by a lighting department the annual expense of which was $10,400. Thus for each dollar spent on the lighting service department an annual return of approximately $5.50 was obtained.

### CONCLUSIONS

An endeavor has been made in this article to point out how a lighting service department may be formed and what it can accomplish for a central station. It must be remembered that local conditions vary and company policies are different, yet it is the belief of the writer that the information given above is elastic enough to be adaptable to all conditions. The point that should be carried in mind is that a lighting service department is an asset to any central station, and the many that are now in existence are proofs of this fact.

The central station that supplies with its product all the service that illuminating engineering can give to meet the demands of modern life will be able to furnish a lighting service of the highest and most satisfactory type. As a result it can watch its good-will and revenue increase and on all sides hear the voice of approval from satisfied customers.

# Output 13.1 per Cent Over Last Year's

CENTRAL-STATION operations during the first half of 1926, as reported monthly to the ELECTRICAL WORLD, showed a continuation of the gain over the preceding year which has been so notable a characteristic of the industry. In the country as a whole the amount of energy generated in January exceeded that of 1925 operations by 10.9 per cent; the excess rose to 15.4 per cent in March, and thereafter fluctuated moderately around the half-year's average, which was 13.1 per cent. The corresponding gain from 1924 to 1925 was 8.4 per cent. The amount of energy generated during the six-month period was 32,934,189,000 kw.-hr.; if the output for the year as a whole bears the normal relation to that for the first half, the total for 1926 should exceed sixty-eight billion kilowatt-hours.

During the period under review a total of 6,357,000,000 kw.-hr. was used in intracompany business, including line losses. The influence of interconnection on the operations of the industry appears to be more marked than ever before, as is indicated by the amount of energy sold by generating companies for resale. This increased from 3,585,000,000 kw.-hr. in 1923 to 4,237,290,000 kw.-hr. in 1924, to 4,379,000,000 kw.-hr. in 1925 and to 6,375,000,000 kw.-hr. in 1926, a gain of 77 per cent in three years and of 40 per cent during the last one.

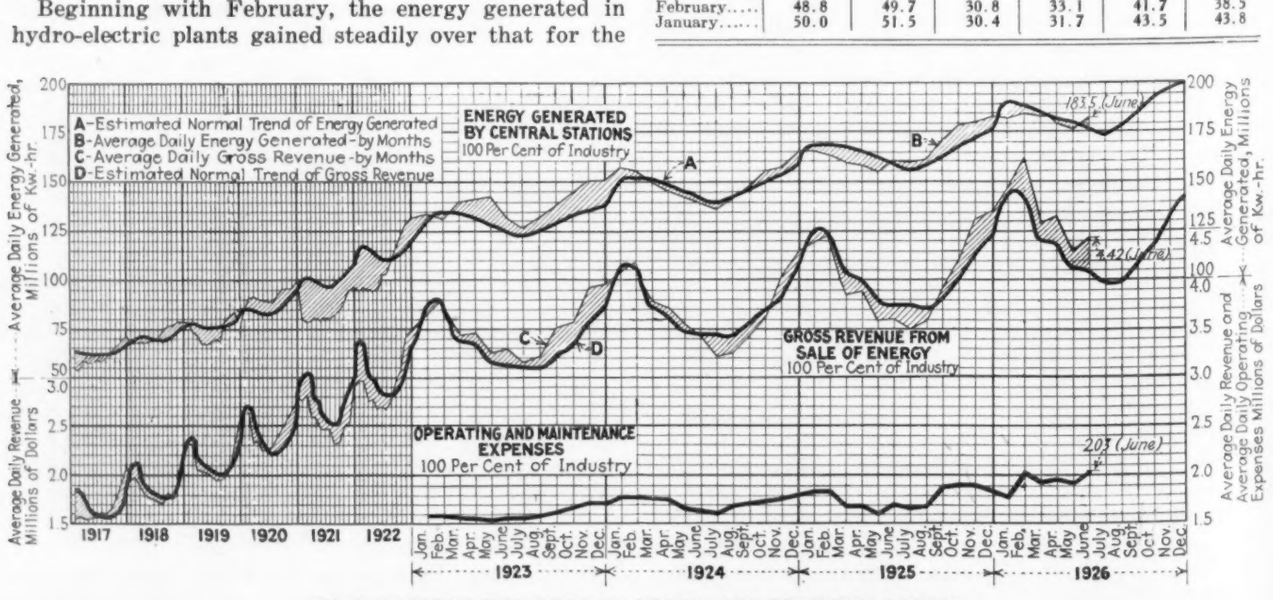
Beginning with February, the energy generated in hydro-electric plants gained steadily over that for the corresponding months of 1925, culminating in June this year in an increase of 20.9 per cent.

The ratio of hydro-electrically generated energy to the total again showed a slight increase. During the half of 1925 it was 38.4 per cent; during the same half of the present year it was 38.9 per cent.

Comparison of the change in fuel consumption with the change in output points to a continued gain in efficiency. The use of oil fuel has again receded, being over 20 per cent below that of 1925, which in turn had fallen as compared with 1924, and the use of gas again increased. But from an energy standpoint these are minor quantities as against the 17,500,000 tons of coal consumed. The circumstance that an increase of 12.3 per cent in the kilowatt-hours generated from fuel was secured with an increase of only 5.4 per cent in the amount of coal consumed should not pass unnoticed.

TABLE I—OPERATING RATIO OF CENTRAL-STATION COMPANIES

| Month | Operating Ratio | | | | | |
|---|---|---|---|---|---|---|
| | Steam Plants | | Hydro Plants | | Combined Hydro and Steam Plants | |
| | 1926 | 1925 | 1926 | 1925 | 1926 | 1925 |
| June | 45.2 | 45.3 | 25.0 | 26.0 | 41.3 | 43.4 |
| May | 41.3 | 43.4 | 34.1 | 28.9 | 39.8 | 40.5 |
| April | 42.0 | 44.0 | 30.0 | 29.0 | 40.0 | 40.5 |
| March | 44.9 | 47.2 | 32.4 | 29.7 | 41.8 | 41.9 |
| February | 48.8 | 49.7 | 30.8 | 33.1 | 41.7 | 38.5 |
| January | 50.0 | 51.5 | 30.4 | 31.7 | 43.5 | 43.8 |


A-Estimated Normal Trend of Energy Generated
B-Average Daily Energy Generated-by Months
C-Average Daily Gross Revenue-by Months
D-Estimated Normal Trend of Gross Revenue
ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
183.5 (June)
142 (June)
203 (June)
Average Daily Energy Generated, Millions of Kw.-hr.
Average Daily Revenue, Millions of Dollars
Average Daily Revenue and Average Daily Operating Expenses Millions of Dollars
1917 1918 1919 1920 1921 1922
1923 1924 1925 1926

ENERGY OUTPUT CONTINUES TO OUTRUN THE ESTIMATED NORMAL

TABLE II—GENERATION AND DISTRIBUTION OF CENTRAL-STATION ENERGY IN THE UNITED STATES

(100 per Cent of the Industry)

| Month | Kw.-Hr. Generated Monthly * | | | Estimated Distribution of Energy Generated | | | | | | | | | | Energy Purchased by Public Utilities for Resale, Kw.-Hr. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Energy Consumption by Central-Station Customers, Kw.-Hr. | | Energy Consumed for Lighting, Kw.-Hr. | | Energy Consumed for Power, Kw.-Hr. | | Energy Sold to Electric Railways, Kw.-Hr. | | Energy Used in Intracompany Business, Including Line Losses, Kw.-Hr. | | | |
| | 1926 Thousands | 1925 Thousands | Per Cent Inc. | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands |
| January | 5,683,055 | 5,121,776 | +10.9 | 4,586,055 | 4,133,776 | 1,260,000 | 1,168,000 | 2,771,055 | 2,429,776 | 555,000 | 536,000 | 1,097,000 | 988,000 | 1,010,000 | 690,000 |
| February | 5,190,645 | 4,621,235 | +12.9 | 4,188,645 | 3,729,235 | 1,128,000 | 1,044,000 | 2,559,645 | 2,201,235 | 501,000 | 484,000 | 1,002,000 | 892,000 | 980,000 | 680,000 |
| March | 5,727,028 | 4,963,857 | +15.4 | 4,621,028 | 4,005,857 | 1,212,000 | 1,123,000 | 2,854,028 | 2,346,857 | 555,000 | 536,000 | 1,106,000 | 958,000 | 1,110,000 | 795,000 |
| April | 5,389,573 | 4,777,289 | +12.8 | 4,349,573 | 3,854,289 | 1,152,000 | 1,067,000 | 2,655,573 | 2,278,289 | 542,000 | 509,000 | 1,040,000 | 923,000 | 1,118,000 | 792,000 |
| May | 5,437,798 | 4,812,665 | +13.0 | 4,387,798 | 3,883,665 | 1,164,000 | 1,089,000 | 2,663,798 | 2,255,665 | 560,000 | 539,000 | 1,050,000 | 929,000 | 1,057,000 | 737,000 |
| June | 5,506,090 | 4,829,035 | +14.0 | 4,444,090 | 3,896,035 | 1,150,000 | 1,067,000 | 2,752,090 | 2,306,035 | 542,000 | 523,000 | 1,062,000 | 933,000 | 1,100,000 | 685,000 |
| Totals for six months | 32,934,189 | 29,125,857 | +13.1 | 26,577,189 | 23,502,857 | 7,066,000 | 6,558,000 | 16,256,189 | 13,817,857 | 3,255,000 | 3,127,000 | 6,357,000 | 5,623,000 | 6,375,000 | 4,379,000 |

*Data on "energy generated" are those collected and published by the United States Geological Survey for all public utilities minus such data as are collected on energy generated by electric railway companies, reclamation service and manufacturing plants. The data are, therefore, for the electric light and power industry only.

The earnings reflect, in a general way, the changes in energy generated. The gross revenue for the half year rose by 12.6 per cent to a new high level of $842,600,000, which indicates that the billion-and-a-half-dollar-a-year mark has been definitely passed. The operating ratio, or ratio of operating expenses to the gross revenue from the sale of energy, shows that financially the industry is in a slightly better position than it occupied this time last year. The operating ratio reported for June by companies having steam plants only, taken in the aggregate, was 50.0 per cent, which is a little below the operating ratio reported by this class of operating companies in June of last year. The operating ratio of these companies increased each month from the low figure of 41.3 per cent in February, but this increase is normal, resulting partly from the seasonal decrease in the proportional amount of high-revenue residential load and partly from a relative increase in operating expenses due perhaps to increased outdoor construction as the weather becomes more favorable. For hydro plants the operating ratio varies somewhat erratically around 30 per cent, but shows on the whole no marked change from last year. The same statement holds for the mixed plants.

Again following the trend previously established, the gain in revenue was not quite so great as the increase in output, the figures for the half year being 12.6 and 13.1 per cent respectively. This is what might be expected in view of the growing magnitude of intercompany sales.

TABLE III—CENTRAL-STATION FINANCIAL OPERATIONS IN THE UNITED STATES

(100 per Cent of the Industry)

| Month | Total Gross Revenue from Sale of Energy† | | | Estimated Distribution of Gross Revenue | | | | | | | | Total Operating and Maintenance Expenses‡ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lighting Customers | | Power Customers | | Electric Railways | | Other Public Utilities | | | |
| | 1926 Thousands | 1925 Thousands | Per Cent Inc. | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands | 1926 Thousands | 1925 Thousands |
| January | $149,700 | $137,300 | + 9.6 | $98,100 | $92,500 | $37,500 | $33,500 | $5,000 | $4,800 | $9,100 | $6,500 | $58,700 | $55,100 |
| February | 145,000 | 128,800 | +13.0 | 93,600 | 86,100 | 37,000 | 31,600 | 4,800 | 4,500 | 9,600 | 6,600 | 56,900 | 51,500 |
| March | 142,000 | 124,400 | +12.4 | 90,400 | 82,900 | 37,200 | 30,000 | 4,800 | 4,700 | 9,600 | 6,800 | 59,800 | 53,800 |
| April | 140,000 | 122,400 | +14.4 | 89,400 | 81,000 | 35,800 | 30,000 | 4,800 | 4,600 | 10,000 | 6,800 | 58,700 | 53,400 |
| May | 133,200 | 118,800 | +12.1 | 85,200 | 79,400 | 34,200 | 28,600 | 4,800 | 4,500 | 9,000 | 6,300 | 59,700 | 54,000 |
| June | 132,700 | 116,000 | +14.4 | 83,700 | 81,000 | 34,900 | 24,700 | 4,600 | 4,300 | 9,500 | 6,000 | 61,000 | 54,900 |
| Totals for six months | $842,600 | $747,700 | +12.6 | $540,400 | $502,900 | $216,600 | $178,400 | $28,800 | $27,400 | $56,800 | $39,000 | $354,800 | $322,700 |

†Aggregate gross revenue from actual consumers, and sales to other public utilities for resale, involving a certain amount of duplication.
‡Do not include interest, taxes, depreciation or sinking fund.

TABLE IV—OPERATIONS OF CENTRAL-STATION HYDRO AND FUEL PLANTS IN THE UNITED STATES*

(100 per Cent of the Industry)

| Month | Energy Generated | | | | | | Fuel Consumption | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hydro Plants | | | Fuel Power Plants | | | Coal | | | Oil | | | Gas | | |
| | 1926 Thousands of Kw.-Hr. | 1925 Thousands of Kw.-Hr. | Per Cent Increase | 1926 Thousands of Kw.-Hr. | 1925 Thousands of Kw.-Hr. | Per Cent Increase | 1926 Short Tons | 1925 Short Tons | Per Cent Increase | 1926 Barrels | 1925 Barrels | Per Cent Increase | 1926 Thousands of Cubic Feet | 1925 Thousands of Cubic Feet | Per Cent Increase |
| January | 1,928,775 | 1,676,536 | +15.0 | 3,754,280 | 3,445,240 | + 8.9 | 3,272,761 | 3,230,153 | + 1.3 | 972,131 | 1,329,855 | —26.8 | 3,661,363 | 2,898,225 | +26.3 |
| February | 1,886,471 | 1,725,877 | + 9.3 | 3,304,174 | 2,895,358 | +14.1 | 2,886,534 | 2,741,313 | + 5.3 | 683,580 | 959,595 | —28.8 | 3,328,365 | 2,457,463 | +35.4 |
| March | 2,237,457 | 2,009,222 | +11.3 | 3,489,571 | 2,954,635 | +18.1 | 3,071,092 | 2,754,265 | +11.5 | 670,248 | 791,496 | —15.3 | 3,899,085 | 3,214,656 | +21.2 |
| April | 2,279,976 | 1,988,621 | +14.1 | 3,109,597 | 2,788,668 | +11.5 | 2,742,058 | 2,587,289 | + 5.9 | 600,368 | 658,080 | — 8.7 | 3,465,746 | 3,367,663 | + 2.9 |
| May | 2,266,590 | 1,922,231 | +17.6 | 3,171,208 | 2,820,434 | +12.4 | 2,720,826 | 2,579,798 | + 5.5 | 570,029 | 639,763 | —10.8 | 3,710,217 | 3,434,604 | + 8.3 |
| June | 2,192,005 | 1,810,908 | +20.9 | 3,314,085 | 3,018,127 | + 9.8 | 2,805,618 | 2,704,974 | + 3.7 | 586,803 | 755,692 | —22.3 | 4,192,412 | 3,667,081 | +14.3 |
| Totals for six months | 12,791,274 | 11,133,395 | +14.8 | 20,142,915 | 17,922,462 | +12.3 | 17,498,889 | 16,597,792 | + 5.4 | 4,083,159 | 5,134,481 | —20.4 | 22,257,188 | 19,039,692 | +16.9 |

*As collected by United States Geological Survey. The data are for the electric light and power industry only.

# Meeting of British Association at Oxford

## Radio, Electricity Supply, Atomic Structure and Other Scientific Topics Presented—Prince of Wales Opens Sessions

BY PROF. A. E. KENNELLY
Harvard University, Cambridge, Mass.

THE British Association, or B. A., as it is often called, was founded in 1831, or nearly a century ago, and has held annual meetings in various cities of Great Britain and its dependencies since that time. The one recently held was the fourth meeting of the association in Oxford, the first having been in 1832. Oxford, as the seat of a celebrated university and as a residence of scholars for nearly a thousand years, is an ideal place for a B. A. meeting. It offers a number of suitable meeting halls, fairly well distributed as to proximity for simultaneous sessions, and it contains a number of museums and scientific collections. Oxford is so accustomed to summer conventions that the accommodation of more than 3,000 scientifically minded visitors for a week did not give rise to any manifest perturbation or mar its academic calm.

The meeting was opened by the Prince of Wales in the celebrated Sheldonian Theater, built in 1669 by Sir Christopher Wren. The arrangements for this opening meeting were so well made that all the seats in the hall were occupied by the audience ten minutes in advance of the zero hour, and precisely on time the Prince, escorted by the vice-chancellor of the university, entered and took his seat. The Prince himself was the president of the association this year, and he read the presidential address, a 50-minute discourse dealing extensively with the history of the association and with its sociological influences and pointing out the great importance of scientific research to the welfare of the community.

### ARRANGEMENT OF PROGRAM

The B. A. is accustomed to hold two general meetings, one at the opening and the other at the closing of its week's business, and to divide itself into thirteen sections for actual business between those two events. The thirteen sections run from A to M inclusive; but it is necessary to split two of these into a pair of subsections each, so there are virtually fifteen sections carried on the backs of thirteen alphabetical letters. Engineering occupies a middle position down the list, being assigned to letter G. Each section has a president, nominated in advance, who is called upon to present a written sectional address on the first day's meeting. These sectional addresses, together with the opening address of the association president, are printed each year and are available to the members during the later part of the convention week. The booklet so published is of great scientific interest as furnishing, in the opinion of the thirteen section experts, the respective main advances of science in those various fields during the preceding year. In this case the addresses make an orange-colored book of nearly 270 pages, almost all very readable even by non-experts.

The address to Section G was by its president, Sir John F. C. Snell, past-president of the Institution of Electrical Engineers, on "The Present and Future Development of Electricity Supply." This paper sums up the statistics of electric power distribution in Great Britain and presents the prospect of large and speedy development of electric supply, especially for service in the homes of the land. The existing annual energy delivery of $7 \times 10^{12}$ watt-hours, or seven watt-hour-twelves, may be taken as representing not far from 20 watts per head of population maintained night and day. It is pointed out that the total annual output of energy might reasonably be carried in about fifteen years to, say, 47 watt-hour-twelves, including domestic energy, industrial energy and railway traction energy, representing more than 100 watts continuously per head of population expected for that date. The great bulk of the energy output would have to be furnished from coal, but a very appreciable portion might come to be developed hydro-electrically from water-falls and perhaps from tides.

Very little attention was given at this year's meeting either to radio or to relativity, subjects that have been conspicuous at recent meetings. On the other hand, the subject of atomic structure received considerable attention in papers and discussions.

In a public lecture associated with the meeting Captain Eckersley described the recent work of the Geneva conference in regard to broadcasting radio wave lengths. There were in Europe no less than 280 radio stations either erected or in course of erection, and international agreement was necessary in allotting broadcasting wave lengths. Nine exclusive wave lengths had been assigned to Great Britain, in addition to a few non-exclusive wave lengths. This new arrangement would entail a modification in the wave lengths now employed by several British broadcasting stations.

### "EVOLUTION" FIRMLY SEATED

At the early previous meetings of the B. A. in Oxford, in 1832 and in 1860, acrimonious discussions occurred over "evolution." In particular, the theories given in Darwin's "Origin of Species" were debated very vigorously in 1860 between Bishop Wilberforce of Oxford as antagonist and Huxley as protagonist. It is significant that at this year's meeting there have been various unchallenged, strongly urged views in support of evolution. The once famous hostility of Oxford to evolution that manifested itself at all three preceding Oxford meetings has disappeared. In the presidential address to Section D on zoology, it is stated:

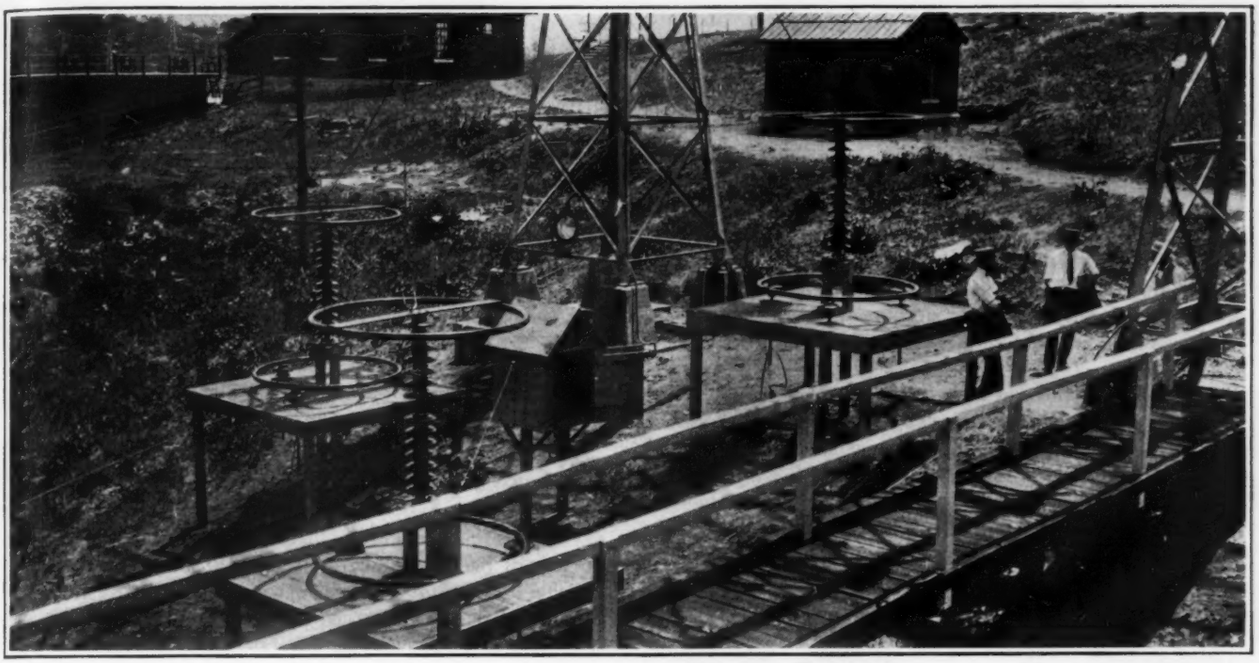
"Taking, however, the word 'proved' as we use it in ordinary life—for example, in relation to a matter inquired into by a court of law—then we are completely justified by the data of embryology and paleontology in stating that evolution is a definitely proved fact."

Again in the presidential address to Section H on anthropology the following is the second sentence:

"At the present time there is no longer any doubt among scientific workers that the body and mind of man are the outcome of a long process of descent with modification and that all life on earth is genetically one."

Prof. H. F. Osborn of Columbia University, New York, a leading exponent of zoological evolution, was one of ten visiting scientists in the British Association to receive an honorary Sc.D. degree from Oxford University during the week. He delivered a paper on "The Problem of the Origin of Species as It Appeared to Darwin in 1959 and as It Appears Today."

It is perhaps not too much to say that the general subject of "Evolution" gave the keynote to the recent Oxford meeting, including evolution in engineering.



A TYPICAL 110-KV. KLYDONOGRAPH INSTALLATION

# Arrester Tests with the Klydonograph

## Results of Investigations on Several Station-Type Autovalve Arresters During Summer and Fall of 1925—Characteristics of Lightning Discharges Observed for Storms Differing Widely in Degree of Severity

By L. R. GOLLADAY
*Supply Engineering Department, Westinghouse Electric & Manufacturing Company*

INVESTIGATIONS of performance of lightning arresters have previously been restricted to the laboratory because of the lack of suitable recording instruments. The most practical device for recording arrester operation was formerly the telltale paper, which gave very limited information. The klydonograph, as developed by Messrs. Peters, Cox and Legg*, becomes an important tool of the investigator of surge phenomena. By this means 220-kv. lines have been investigated. A typical installation for 110 kv. is shown above.

Investigations made during the 1925 season may be classified in three groups: Tests on arresters, tests on overhead systems, and tests on cable systems.

Fig. 2 shows the diagram of connections used in investigating arresters where one klydonograph is used for a double arrester installation and records total ground current and potential of one conductor of each circuit. A test on two 66-kv. station-type autovalve arresters was started Aug. 7, 1925, at Cumberland, Md.

Detail pictures show the installation, which is at the end of a 53-mile double-circuit line. The resistance of the shunt in the ground connection was 14.5 ohms. The potential was measured on the top conductor, as theory and previous experience had shown that it was subjected to the highest lightning potentials.

On Aug. 10 a surge of 70 kv. crest value to ground was recorded on both lines with an oscillatory discharge of 370 amp. initial value through one arrester. The breakers of both lines tripped. The arrester voltage record is too small to cause a discharge, so it is probable that higher voltages existed on one or both of the other conductors.

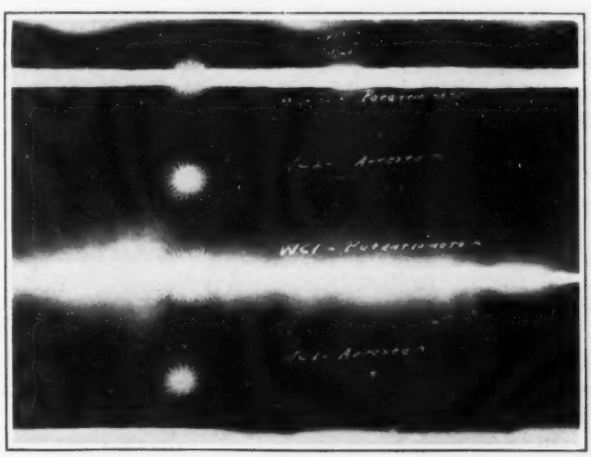


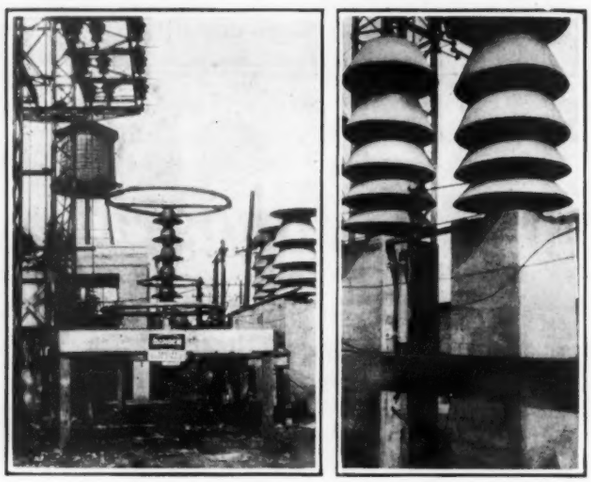
FIG. 1—KLYDONOGRAPH PICTURE OF LIGHTNING DISCHARGES

*"The Klydonograph and its Application to Surge Investigation," by Cox and Legg. *Journal* A.I.E.E., October, 1925.

The tripping of the breakers indicated an insulator flashover, which may have been on the conductor connected to the klydonograph.

On Aug. 31 there was another lightning storm during which there were recorded two discharges on each line within a period of 40 minutes. The first surge was at 1:35 p.m. on line No. 1, current 560 amp., voltage 167 kv. At 1:50 p.m. there was a simultaneous discharge on both arresters, accompanied by tripping of the breakers, 560 amp., 162 kv. on line No. 1 and 500 amp., 189 kv. on line No. 2. At 2:15 there was a surge on line No. 2 of 570 amp., 189 kv., accompanied by tripping of the breaker. Fig. 1 is a klydonogram of these discharges.

On Sept. 3 there was a surge of 178 kv. with no arrester discharge on line No. 1. The cause of this surge is unknown. This last record seems to indicate that at least 180 kv. crest (127 kv., R.M.S.) to ground is required for an arrester discharge. In other words, the relief voltage to ground is about twice line voltage. Also that where discharges were recorded with lower



KLYDONOGRAPH ON 66-KV. AUTOVALVE ARRESTERS

voltages, they were due to higher voltages on the other conductors.

Each arrester discharge that was recorded was oscillatory with rapidly decreasing amplitude. These were probably due to line oscillations. The initial value of the surge was positive, which indicates that the surge was due to induced lightning.

These records were obtained during the only lightning storms of any consequence between the date of installation of the klydonograph and the end of the season. The results are encouraging and interesting, considering the duration of the test and the fact that observation had previously failed to detect operation of the arresters. The arresters are of the autovalve type and function with a minimum amount of disturbance on the system.

Tests were also made on 27-kv., 37-kv. and 132-kv. arresters, but they were started so late in the 1925 season that no lightning occurred that was severe enough to cause the arrester to discharge. The klydonograph records showed no voltage surges exceeding double-line voltage. These tests will be continued in the 1926 season, and it is expected that they will give more data, as they will be started in time to cover the most of the lightning season.

General klydonograph surge investigations yielded

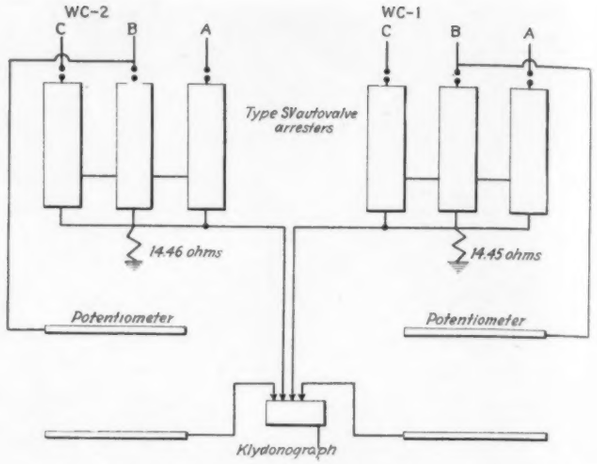



FIG. 2—KLYDONOGRAPH CONNECTIONS AND CALCULATIONS

data of importance regarding the magnitude and frequency of occurrence of switching and lightning surges. It was found that a direct stroke of lightning produces a negative surge, whereas an induced stroke is of positive polarity. According to one theory of cloud charge formation the charge must be of negative polarity, and this is apparently verified. Various investigators have estimated that severe lightning surges on high-voltage lines were of the order of 1,000 kv., which has been verified in these investigations. In the vicinity of the stroke higher potentials undoubtedly occurred. On one 140-kv. ungrounded system there were recorded three direct strokes exceeding ten times normal line to ground voltage (1,150 kv. crest) during the season. On a 120-kv. grounded system there were recorded four direct strokes exceeding ten times normal line voltage (980 kv. crest). On this same system a positive (induced) surge of 900 kv. crest was recorded by the instrument.

Fig. 3 shows the frequency of occurrence of surges of different magnitudes on a 140-kv. ungrounded system between Aug. 24 and Oct. 25. It will be observed that the frequency diminishes as the voltage increases up to nine and a half times normal voltage to ground. This marks the dividing line between induced lightning and direct strokes for these data. The data for direct strokes do not follow the same law. At the other end of the curve the number of surges of less than three times normal voltage increases very rapidly, becoming infinite as normal line-to-ground voltage is approached.

Where there were several klydonographs installed on a system, a surge was seldom recorded at more than

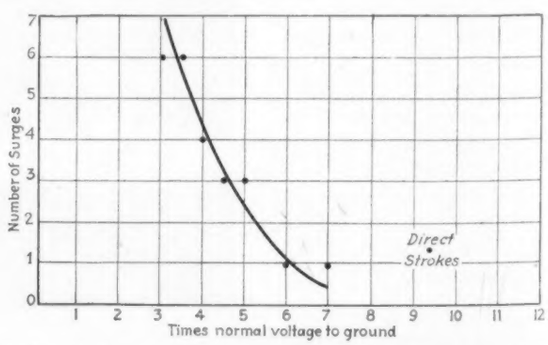



FIG. 3—NUMBER VERSUS MAGNITUDE OF SURGES ON 140-KV., 60-CYCLE UNGROUNDED 240-MILE LINE

one station. In one case, that of a direct stroke of lightning on a 120-kv. line, a 1,000-kv. surge was recorded at the center of a 130-mile line without being recorded at either end of the line. On a 60-kv. line 165 miles long a direct stroke generated a surge of 475 kv. at a point 25 miles from one end of the line and 83 kv. at the distant end. The surges are greatly attenuated on high-voltage lines, probably largely due to corona.

Arcing grounds were found to produce high oscillating voltages. On a 140-kv., 60-cycle ungrounded system potentials of 4.5, 4.2, 3.3 and 2.8 times normal line-to-ground voltage were generated by arcing grounds. These high voltages are dangerous to insulation and would damage arresters unless quickly cleared. Grounds on a 66-kv. grounded neutral system did not produce serious surges.

Extensive tests on cable systems show surges very seldom exceed double normal line-to-neutral voltage. Apparently a cable system that is not directly connected to an overhead system has slight need of lightning protection.

In conclusion the writer wishes to acknowledge his indebtedness to J. H. Cox, who directed the klydonograph investigations and supplied the data.

# Letters from Our Readers

## Induction Motors on Alternating-Current Networks

*To the Editor of the* ELECTRICAL WORLD:

In the Aug. 14 issue of the ELECTRICAL WORLD, page 324, Prof. R. G. Warner, presenting data under the title "Characteristics of Induction Motors on Alternating-Current Networks," makes several statements which may be misleading. I quote one in particular as follows: "When 220-volt motors are to be applied on circuits supplied with 199 or 208 volts, larger motors than normal should be selected." This sentence is followed with the demonstration that motors need to have an output rating varying from 5 per cent to 18 per cent greater than normal, depending upon which voltage is used and whether torque or permissible heating happens to be the limiting factor. When it is realized that standard general-purpose motor sizes are such that ratings vary in all cases at least 20 per cent, and that in some cases the variation is greater than 33 per cent, it will be seen that in using motors commercially it is not possible to make selections within 5 per cent or 10 per cent, which is all the variation which occurs in the case of 208 volts.

Where alternating-current networks are being adopted with 199 or 208 volts, the purpose is to combine light and power on one set of mains, and large variations in the voltage supply to the motors cannot occur if the system operates with satisfactory lighting voltages. Standard motors have a manufacturer's guarantee of successful operation with terminal-voltage variations of 10 per cent plus or minus; so that with system voltages of 208 volts, the motor is guaranteed to operate successfully at its output rating with a terminal variation of 5 per cent below the normal system voltage. Normal system voltages are the voltages supplied at the utilization device (lamp, motor, etc.) under normal load conditions. Line drops between properly regulated services and the terminals of any utilization device will not exceed 3 per cent if the wiring meets National Electrical Code requirements. I doubt if undervoltage releases will be seriously affected by use of the lower power voltages, as they do not function without a drop in voltage in the order of 50 per cent. Systems of the character which use alternating-current networks are less likely to experience large drops in voltage on local disturbances than are those systems now more commonly in use throughout the country. Of course, in cases where the supply voltage is affected, each is equally affected, and in this case there is a 5 per cent or 10 per cent difference, depending upon which system is used.

If 199-volt and 208-volt systems are to be used which have wide variations, then difficulties may be experienced unless a larger-sized induction motor is used. However, with the application of the system restricted, as at present, to locations where the power voltage is maintained within the limits of commercial variation now used on lighting services, then standard 220-volt motors will operate successfully without increase in size. In fact, with the 208-volt system, the potential at the terminals will be within the limits at which the manufacturer guarantees the operation to be successful for rated output.

A. H. KEHOE,
Electrical Engineer.
United Electric Light & Power Company,
New York, N. Y.

## What Has Been Done on Baker River to Solve the Fish Problem

*To the Editor of the* ELECTRICAL WORLD:

A copy of the July 24 issue of the ELECTRICAL WORLD has just come to notice and contains on page 156 an editorial under the caption "Fishing and Power Interests Settle Their Problems." The second paragraph of this editorial is slightly misleading and might be misconstrued. I have been a member of the utilities committee investigating the problem of putting fish over high dams and am therefore commenting on these experiments as we see them.

The second sentence of the second paragraph of this editorial, while not definitely stating such a fact, leads to the belief that on the Baker River fishway the salmon negotiated the entire 260 ft., the height of the dam, by their own efforts and would also lead the reader to believe that this fishway consists of jumping pools for the entire height. This is not entirely correct. The lower part of the fishway consists of jumping pools by which the fish ascend approximately 30 ft. above the water level in the river where the climb began. From this elevation the fish swim up to a point near the base of the dam by means of a wooden flume. They jump from this flume into a pool containing the metal car in which they are transported on an industrial track the remaining 230 ft. to the top of the dam by means of an electric hoist.

We feel that considerable progress has been made toward the solution of the fishway problem by the results secured on Baker River. The significant thing in the success of this fishway is not the fact that the fish have been taken over by a mechanical device, because the question as to whether they could be hoisted or not has never been an issue; but that the fish have been diverted from their usual course and led to the entrance of the fishway by the discharge from the wheels. We were told at the start that if we were able to catch the fish, it was an easy matter to raise them. This has been accomplished.

J. E. YATES.
Pacific Power & Light Company,
Portland, Ore.

# Central Station and Industrial Practice

## Graphical Data Facilitate Operating Supervision

SOME companies and individuals recognize the value of making operating data promptly available in graphical form for ready assimiliation, interpretation and guidance of future conduct. One such company is the Ohio Power Company, of which E. H. McFarland is manager of power plants and J. A. Bergin superintendent of the Philo station. This company makes the most frequently consulted data of the past several months available in four graphical forms on 2x3-ft. hinged panels in the manager's office usually within one day after they are collected. Such despatch is permitted by making one extra copy of all data recorded and sending it to the operating room of the plant, where the men on duty plot the information when not engaged in their regular duties. As a result no extra clerical force is required, the data are plotted promptly and the chief operators are thereby impressed with operating conditions more emphatically than by mere tabulated figures.

Numerous uses are made of the graphical data. For example, they permit checking and comparing day-to-day operation, correcting conditions before they persist too long, basing operation on previous experience and compact filing of pertinent data for future reference. The graphs give an instant picture of conditions over any period without having to bother any one, although detailed figures are available in the usual form for consultation. For this reason an operating executive or plant superintendent who may have been out of immediate touch with local conditions for a few days or weeks is able to ascertain readily

### Graphical Data Maintained and Legend Used

(Sunday date lines emphasized in red)

**Master Sheet**

*Indicated by colored blocks; dates as ordinates; unit values as abscissas*

A. Million kilowatt-hours generated (cumulative).
Unit No. 1 (red); Unit No. 2 (green).

B. Thousand tons of coal received and consumed.
Received (blue); consumed (red).

C. Million pounds steam consumed by turbines (cumulative).
Unit No. 1 (red); Unit No. 2 (green).

D. Million pounds water evaporated.
Group 1—Reheat unit 1 (black); unit 2 (blue); unit 3 (yellow); unit 4 (green).
Group 2—Reheat unit 1 (brown); unit 2 (orange); unit 3 (red); unit 4 (gray).

*Indicated by colored curves; dates as abscissas*

E-1. Equivalent coal loss in ash, per cent based on weekly samples (yellow).
2. British thermal units per kilowatt-hour output—daily (red); cumulative (blue).
3. British thermal units per pound coal fired (green).
4. Boiler outlet temperature, degrees Fahrenheit (red).
5. Economizer outlet temperature, degrees Fahrenheit (blue).
6. Stack temperature—No. 1 (yellow); No. 2 (green).
7. Pounds steam to condenser per kilowatt-hour generated — daily (red); cumulative (blue).
8. Actual evaporation—daily (yellow); cumulative (green).
9. Pounds coal per kilowatt-hour—daily (red); cumulative (blue).
10. Station average load per day (red).
11. Generator load factor per day (red).
12. Plant capacity factor per day (blue).

**Coal Sheet**

*Dates as abscissas; unit values as ordinates*

A. Thousand tons coal received (cumulative) from different coal producers indicated by blue, yellow, green, brown and black lines.

B. Tons coal received and consumed (daily).
1. Received from different companies, indicated in colored rectangles one above the other; same legend as A.
2. Consumed, indicated as (red) rectangle next to received.

C. Thousand tons in storage.
1. Total (red line).
2. Submerged (blue line).
3. Dry (green line).

D. Daily coal balance, tons.
1. Surplus (black rectangle).
2. Deficit (red rectangle).

**Boiler Sheet**

*Dates as abscissas, boiler identification numbers as ordinates and condition of boiler as sub-classification of ordinates*

Legend (Block system)—In service (black); available (blue); out of service (red); condition of boiler classified and segregated in graphical form: (1) in service or available; (2) out for boiler tubes; (3) out for furnace walls; (4) out for superheater; (5) out for fans; (6) out for stokers; (7) out for economizers; (8) out for air heater; (9) out for tube slagging; (10) out for valves and joints.

**Turbine Sheet**

*Dates as abscissas*

COLORED CURVES

A. 1. Total kilowatt-hours generated (red).
2. Net kilowatt-hours generated (blue).
3. Kilowatt-hours to Line *A* (yellow).
4. Kilowatt-hours to Line *B* (green).

B. Pool level supplying circulating water.
1. Above dam (red).
2. Below dam (blue).

C. Unit No. 1.
1. Total kilowatt-hours generated (red).
2. Condenser back pressure, inches mercury (blue).
3. Pounds steam to condenser per kilowatt-hour (red).
4. Condenser leakage, per cent (blue).
5. Circulating water temperature—out (red); in (blue).
6. Average kilowatts per service hour (green).

COLORED RECTANGLES

7. Circulating pump in service (yellow).
8. Turbine feed pump in service (red).
9. Motor feed pump in service (green).
10. Reheat in service (blue).

D. Unit No. 2 (same classification as C).

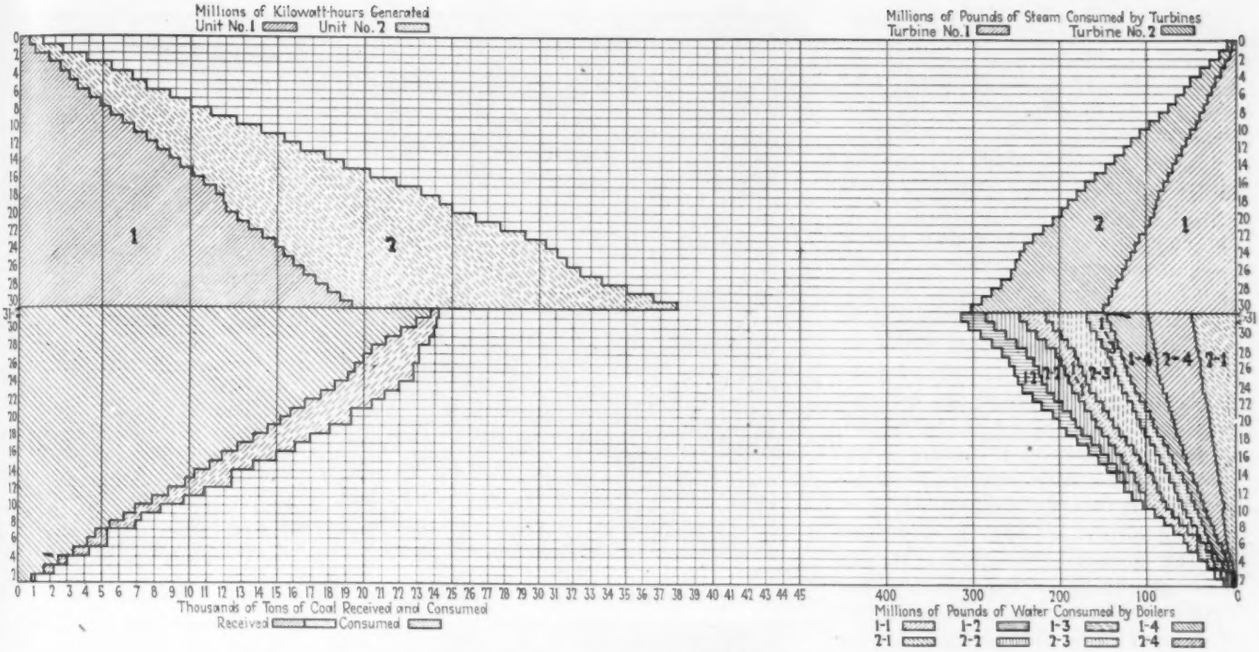



FIG. 1—METHOD OF GRAPHICAL PRESENTATION ON PART OF MASTER SHEET
(Colors used in original, see table for legend)

what has happened in his absence. It also enables prompt and more accurate explanation of occurrences.

Graphical data applying to more than several months back are kept in 3x3-ft. fiber folders in a metal filing cabinet.

Four charts, called the "Master," "Coal," "Boiler" and "Turbine" sheets, give the entire picture. The forms in which the data are plotted are as important as the data and are indicated herewith, although color legends and shading make the actual charts more serviceable than plain black and white graphs. The color legends for each item plotted are indicated in the accompanying table.

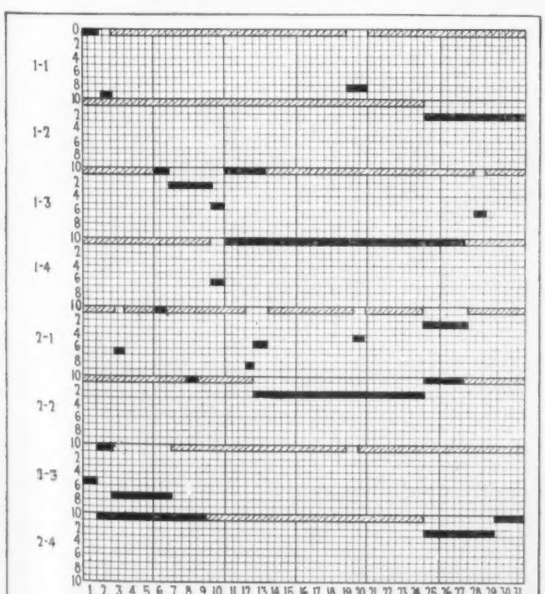



FIG. 2—HOW BOILER SERVICE IS RECORDED
(Colors used in original, see table for legend)

## New Spanish Hydro-Electric Stations

A HYDRO-ELECTRIC station has recently been completed at Tranco del Lobo for the Sociedad Hidroelectrica Espanola. The plant, which was supplied by the Swedish General Electric Company (Asea), utilizes the water power of the River Jucar in the province of Albacete. Under a net head of 41 ft. about 8,800 gal. of water per second is available, representing a potential output of approximately 5,000 hp. Two 1,900-hp. turbines have been installed, these being coupled direct to 1,600-kva. alternators generating 6,600-volt current at 300 r.p.m. Space is, however, provided for the addition of a third group. The current is stepped up for transmission purposes to 66,000 volts by means of three single-phase oil-insulated, natural-cooled transformers.

La Compañia Sevillana de Electricidad is raising $2,000,000 of new capital with the object of financing the establishment of a new hydro-electric station of 24,000 hp. to utilize the water power of the River Cala at a point about 20 miles from Seville. Work on the new plant is well advanced and is expected to be completed early next year.

## Conjectures and Speculations

### MATTER DENSITY AND ELECTRICAL ENERGY

BY C. L. KASSON
Edison Electric Illuminating Company of Boston

IF AN infinitely large dielectric were perfectly homogeneous, the potential distribution or gradient through the material when under an electric stress would be uniform. Since there is no such a thing as perfect homogeneity, the gradient is not uniform, varying all the way from a slight difference as in a homogeneous dielectric, like porcelain, to a very great difference in a composite dielectric, like a paper cable.

This gradient is, of course, coupled with an energy distribution in proportion. In other words, in a perfect dielectric the distribution would be uniform per unit of matter and in a composite dielectric the energy content per unit of the matter would be variable. In ordinary matter of one

kind, if another kind were introduced between the stressed portions of the former, the potential gradients and energy content per unit of the two kinds of matter would be different.

In matter of a liquid or gaseous nature which is mobile, the introduction of a solid dielectric would upset the conditions as explained above. If the matter itself were so moved that a concentration existed within itself that one portion became denser than the rest, then the potential gradient and energy per unit of matter would be greatest in the densest portions. This is the case in air containing moisture, our atmosphere.

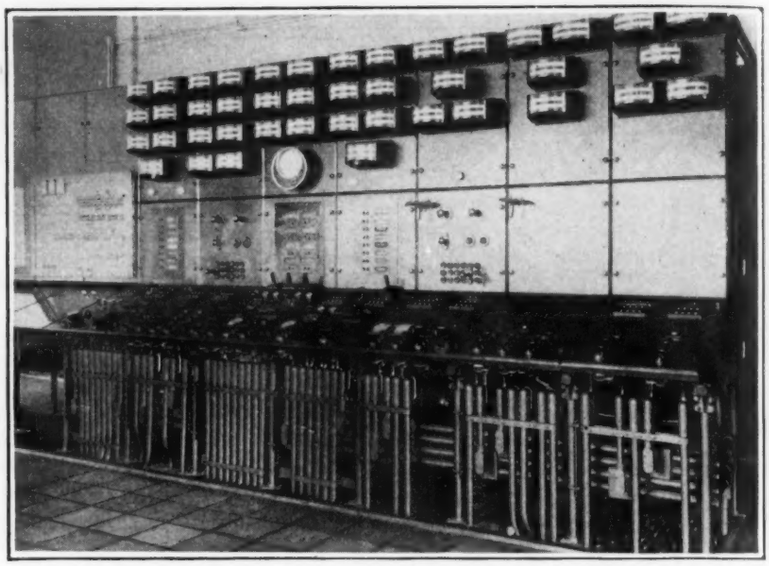
A cloud is denser matter; its matter content, energy content and potential gradient are above the normal for the general atmosphere at the given height above the earth. The cloud is driven by the wind, actuated by temperature differences. If its energy content and gradient become great enough, we perceive rain and lightning. The first, in the broad sense, perhaps restores the matter balance and the second the energy balance. Thus we have, all through matter, heat to motion to electricity to motion to heat—a wonderfully balanced cycle.

## Exposed Control Conduits Facilitate Changes

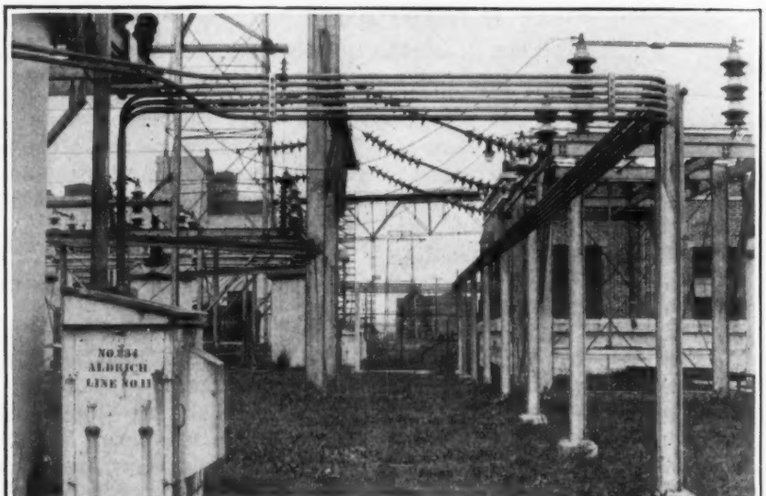
PROMINENT in both outdoor and indoor stations of the Northern States Power Company and typical of the Byllesby engineering practice is the use of exposed control-circuit conduits. Everywhere they are made readily accessible, the chief advantage claimed being that the circuits, when so installed, can be rerouted easily as changes or extensions of stations are made. In addition, any attention to the control wiring is made easy.

In outdoor stations the control conduits are bunched and supported overhead on simple structural steel supports. In inside stations the conduits are run along the ceiling or otherwise made accessible. The control conduits to and from benchboards are exposed in orderly yet accessible form and are not covered by panels, as is customarily done.

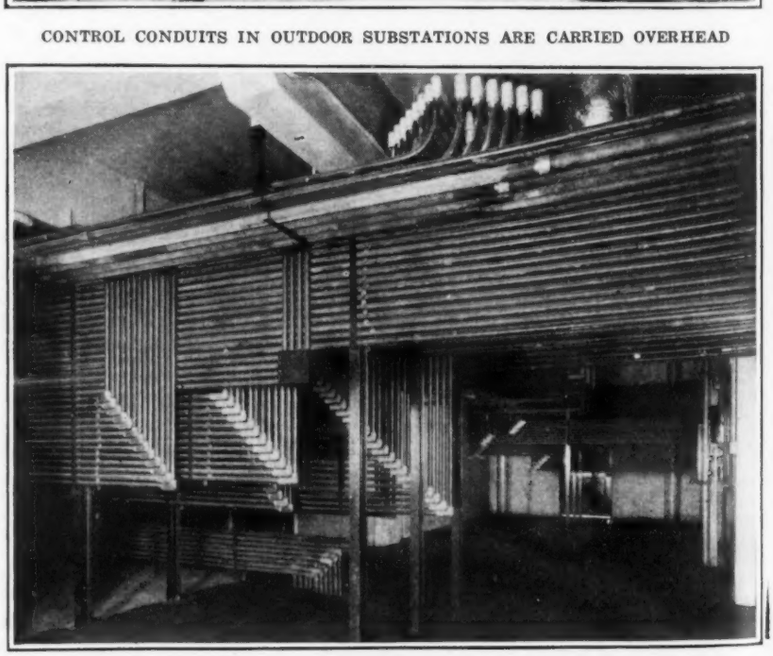
The danger of injuring concealed conduits in buildings or outdoor stations when additions, extensions or changes are made is thus removed. Time is also saved in building construction, because there are no delays caused by waiting for conduit installations in floors and walls.



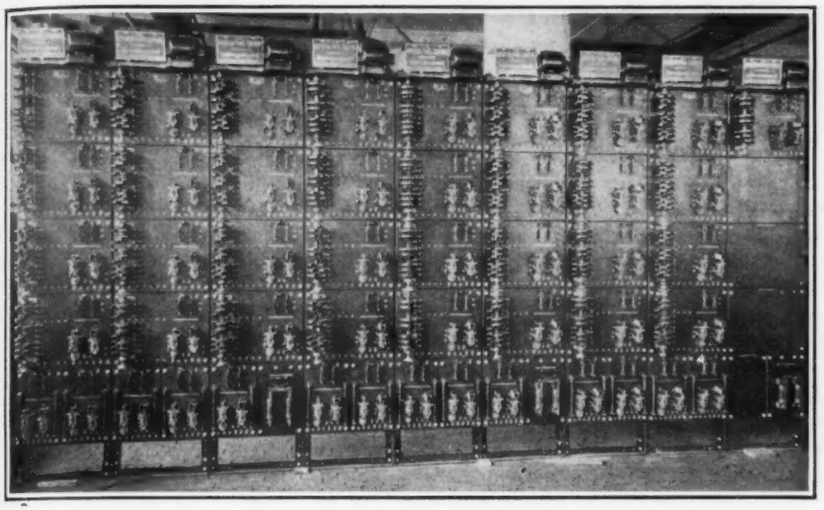
CONTROL CONDUITS TO BENCHBOARD ARE READILY ACCESSIBLE



CONTROL CONDUITS IN OUTDOOR SUBSTATIONS ARE CARRIED OVERHEAD



EXPOSED CONTROL CONDUIT UNDER CONTROL BOARDS



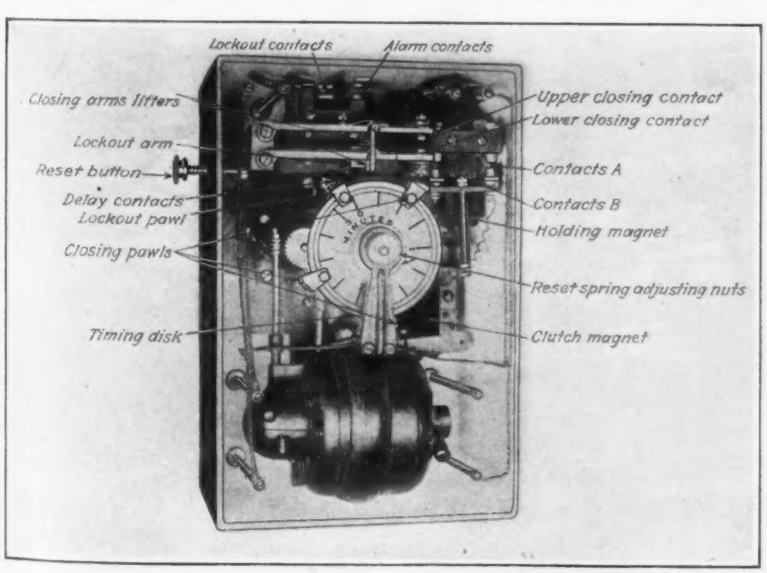
230-VOLT, DIRECT-CURRENT, LAUNDRY CONTROL PANEL IN PLANT OF ECONOMY LINEN SUPPLY COMPANY, NEW YORK CITY

## Automatic Control of Laundry Machines

BY N. L. MORTENSEN
Assistant Chief Engineer
Cutler-Hammer Manufacturing Company,
Milwaukee, Wis.

THE application of individual electric drive in the laundry industry can be considered of rather recent date. Development in the last two years has consisted chiefly of the use of automatic and semi-automatic machines and control. This development has reduced the cost of labor and has insured a better grade of work, due to the more positive functions of machines resulting from automatic operation rather than manual control. Furthermore, it has minimized the human factor in process work, thereby insuring more constant conditions of time as well as of load. Automatic control has also made it possible to install safety devices in the various machines, eliminating a great amount of hazard previously connected with laundry work. It has, furthermore, made it possible to design larger machines with ability to handle increased loads, which would not otherwise have been possible.

Automatic machines and control are today available for practically all kinds of laundry work; in some cases the automatic control governs the temperature as well as the motors. Tumbler control has been developed, which automatically terminates the drying period when the temperature and humidity drop to a predetermined and preset value. This prevents scorching, dusting of dry starch, and gives uniform results. Control for extractors now provides self-timing and interlocks the cover with operations so it cannot be opened until the machine is at rest. Washers have increased considerably in size in recent years, necessitating automatic features for loading and unloading. They are often loaded from overhead hoppers and dump their heavy wet load through chutes or conveyor belts to extractors below. Control equipments have been developed providing automatic stops for loading and unloading functions with door interlock which prevents cylinder motion with the doors open.




RELAY FOR AUTOMATIC RECLOSING OF OIL CIRCUIT BREAKERS WITH ADJUSTABLE TIME INTERVALS UP TO SIX MINUTES

## Relay for Automatic Switch Reclosing

BY ERNEST K. SADLER
San Joaquin Light & Power Corporation,
Fresno, Cal.

THE requirement of relays for automatic reclosing of oil circuit breakers led the San Joaquin Light & Power Corporation several years ago to develop a relay that incorporated such features as being adaptable with no change to the control wiring of oil circuit breakers remotely controlled, permitting the intervals between reclosures to be adjustable up to a total time of six minutes, providing a definite lockout of the reclosing features after the final attempt of the breaker to reclose in cases where the trouble still persists and providing an alarm that functions after the lockout occurs.

A number of relays having these features were built and installed on the system of the San Joaquin Light & Power Corporation, and their success has been sufficient to warrant further refinements. Certain features of this relay are of interest to all operating companies in that all contact points are accessible for cleaning and inspection, and if desired the mechanism is easily removed from the case; time intervals can be easily changed and the timing disk always resets after closing a circuit breaker if the breaker stays closed for three seconds or longer. This feature assures positive time intervals under all conditions, the potential to the driving motor remaining constant, and prevents possibility of having the closing contacts closed when the circuit breaker trips out. Time intervals are changed by simply opening the relay cover and adjusting the closing pawls. This does not require the use of any tools. The timing contacts are designed to prevent the circuit breaker "hammering" or "pumping." The delay element of the relay is absolutely positive, being dependent on the speed of the driving motor for time.

# Commercial Activities and Public Relations

## Profits and Costs in Range and Refrigerator Service

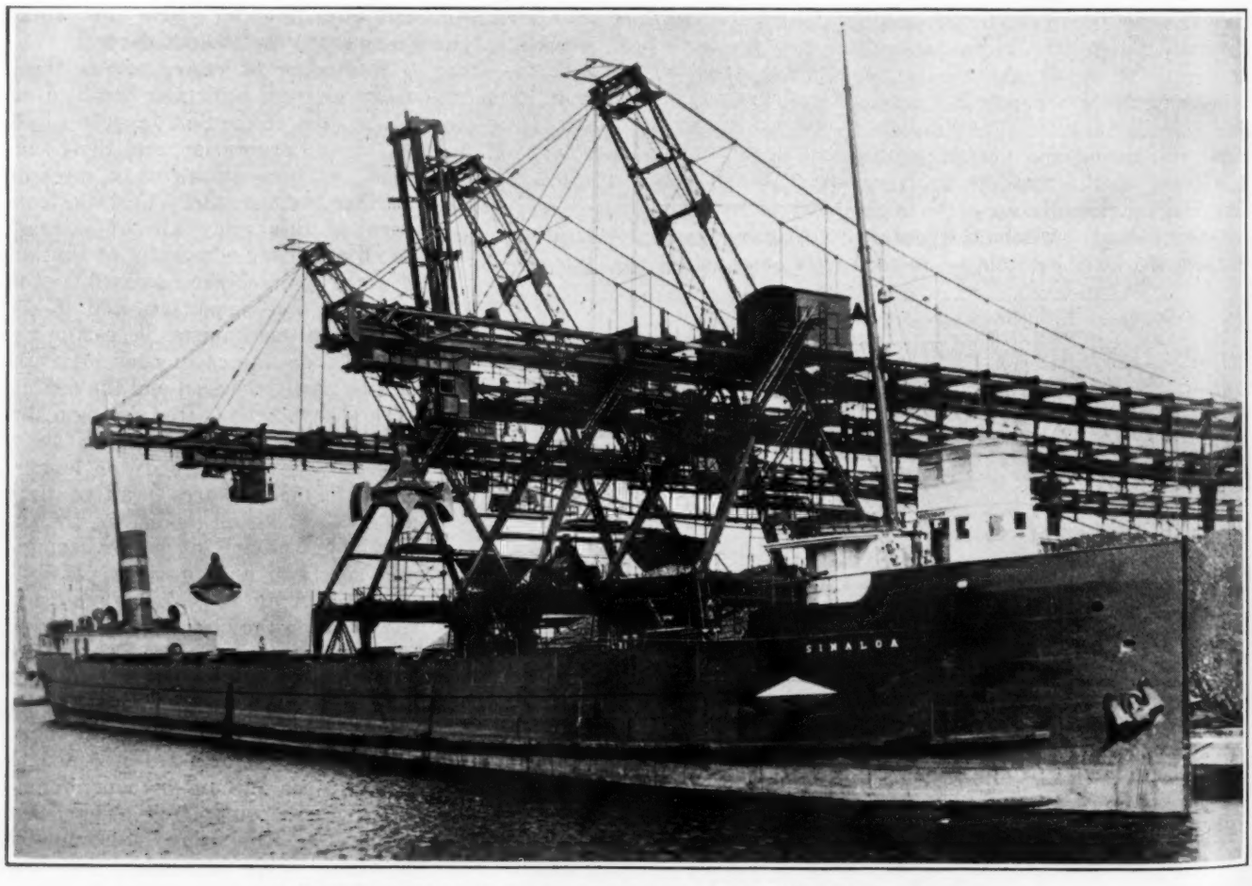
IN THE opinion of some operating companies apparently there are only two fundamental questions in connection with electric ranges and domestic refrigerators that have not been answered to their satisfaction—profitableness of the first load and cost of servicing the second. A very comprehensive report, answering the first question, was presented before the Atlantic City convention of the N.E.L.A.

Regarding the cost of servicing domestic refrigerators, H. E. Young, commercial manager of the Minneapolis General Electric Company, recalls that a few years ago the question of servicing electric ranges seemed almost insurmountable. At that time it seemed impossible to provide servicing at a cost low enough to satisfy the customer if it were charged to him or to keep within a figure that the utility could stand if borne by it. The solution of the problem lay in volume of servicing business, a highly organized and systematized method of attending to this service in an efficient manner, the training of service men to do the work accurately and quickly and the education of customers to pay for a legitimate amount of this servicing expense. Such a procedure has been developed in a number of companies to the point where it now costs them virtually nothing for servicing, and the cost to the customer is negligible.

Electric refrigeration is by far the most promising source of future revenue that has presented itself in recent years to electric-service companies as a whole, since it holds so much promise of becoming a universal household device, and experience with electric ranges indicates that the servicing problem with domestic refrigerators can also be handled.

## Over 2,000,000 Kw.-Hr. Monthly from Coal Handling

ABOUT twenty coal-unloading docks in Duluth-Superior that consumed more than 2,000,000 kw.-hr. in one month are operated on power purchased from the Minnesota Power & Light Company. They have an average connected load of about 2,200 hp. and during the largest consumption month in 1925 used an average of 117,000 kw.-hr. apiece. Although the consumption per connected horsepower per month does not mean much, the maximum of 207 kw.-hr. per horsepower came from a dock having 1,308 connected hp. and the average of 54 kw.-hr. per horsepower came from a connected load of 2,196 hp. A dock that was electrified to the extent of 4,557 hp. consumed 60 kw.-hr. per horsepower. During the month for which the pre-




UNLOADING COAL WITH ELECTRIC MOTIVE POWER AT DULUTH-SUPERIOR

tons of coal was delivered to all coal-unloading docks in Duluth-Superior. These receipts were less than others in the same year (they are seasonal, depending on navigation), but more coal was being rehandled and loaded for land transportation at this time.

Characteristics of four of the smaller docks are shown in the accompanying table, furnished by W. S. Heald, general sales manager of the Minnesota Power & Light Company. In general, service is supplied at 13,000 volts, the customers furnishing their own step-down substations. The 13,000-volt system is virtually a ring system with several sources of supply. For the most part the transformers are installed in concrete or brick houses, although one or two installations are outdoors. In all cases the customers' service is switched on the 13,000-volt side. Most of the docks use rotary converters and direct-current equipment, hence power factor is not of so much consideration as with alternating-current operation in determining transformer sizes. Because of the highly fluctuating load, integrating demand meters are used. On account of the navigation season being open only about seven months a year, considerable difference in consumption exists between the summer and winter season, when the equipment is used chiefly for reshipping by rail.

## Promoting Good Will by Merchandising

BY A. F. MORIARITY
Sales Manager Central Arizona Light & Power Company, Phoenix, Ariz.

CREATING public good will through the sale of electrical appliances is an opportunity that, in the opinion of the writer, has been overlooked by many central-station companies. The fact that only about half of the utilities were merchandising in the year 1925 indicates that merchandising was not considered necessary in the promotion of good public relations by many central-station executives. Undoubtedly some of the executives of the companies that did merchandise looked upon this job as that of the sale of appliances rather than as utility merchandising.

If we look upon it simply as a sales problem, primarily for building load, it is easy to see how the good-will aspect may be slighted. There is a fine point of distinction between "selling appliances" and "merchandising." As an example of real merchandising we need only look at the average mercantile establishment. Here we find service and good will back of every sale. Obviously the primary motive of the merchant is profit, just as load building is the objective of every central station that merchandises, but the success of each is measured in the same units—satisfied customers.

It is upon this theory that the Central Arizona Light & Power Company went into the merchandising business six months or more ago. The company concerns itself not alone with the sale of appliances and the sale of the kilowatt-hour, but with following the kilowatt-hour beyond the meter to its ultimate utilization as well. During the past few years numerous electrical appliances

### Characteristics of the Load and Equipment of Four of the Smaller Coal Docks in Duluth-Superior

| Dock | Connected Load, Hp. | Maximum Annual Demand, Kw. | Maximum Monthly Consumption, Kw.-Hr. | Minimum Monthly Consumption, Kw.-Hr. |
|---|---|---|---|---|
| A..... | 1,540 | 543 | 60,480 | 21,600 |
| B..... | 1,255 | 466 | 116,640 | 39,600 |
| C..... | 1,300 | 726 | 277,920 | 151,200 |
| D..... | 1,092 | 950 | 221,760 | 87,840 |

#### Dock A

*Transformers*

Two 330-kw. power transformers on bridge
One 2-kw. lighting transformer at office

*Connected Load*

Four 150-hp. motor hoists
Four 75-hp. motor trolleys
Two 15-hp. motor air compressors
Two 100-hp. motor car loaders
Eight 30-hp. motor moving motors
Two 40-hp. motor boom hoists
Two 10-hp. motor rail clamp
One 40-hp. motor screening plant
Two 15-hp. motor 15-kw., 110-volt generator
One 2-hp. motor wagon loader
Total, 28 motors, 1,542 hp.
Connected lighting load 2-kw.
Total..... 1,152 kw.

#### Dock B

*Transformers*

One 150-kva., 3-phase power transformer
One 100-kva. power transformer
One 300-kva. three-phase transformer
Two 10-kva. lighting transformers
One 1½-kva. lighting transformer

*Connected Load*

One 30-hp. motor portable screening plant
Two 444-hp. motor rotary converters
One 50-hp. motor car puller
One 50-hp. motor portable screening plant
One 40-hp. motor screening plant
Two 25-hp. motor screening plants
One 15-hp. motor screening plant
One 25-hp. motor coal shed
One 10-hp. motor shop
One 25-hp. motor scraper
One 25-hp. motor car loader
Two 20-hp. motor portable screening plants
One 7½-hp. motor portable screening plant
Total, 16 motors, 1,255½ hp.
Lighting load..... 22
959

*Direct-Current Side of Rotary*

Two 22-hp. car loader
Two 70-hp. rack
Two 5-hp. air compressors
One 50-hp. boom hoist
One 295-hp. hoist
One 200 hp. hoist
Two 90hp. racks
One 50-hp. boom
One 200 hp. propelling
Four 50-hp. propelling

#### Dock C

*Transformers*

Two 400-kw. transformers
One 5-kw. lighting transformers

*Connected Load*

Two 400-hp. rotary converters
One 500-hp. flywheel set
Total connected load, 1,300 hp..... 970 kw.
Lighting load..... 6 kw.
976 kw.

Connected Load on Direct-Current Side of Rotary

One 3-hp. motor pump
Two 250-hp. motor hoists
Four 75-hp. motor racks
Two 10-hp. motor air compressors
Four 75-hp. motor bridge moving
Four 35-hp. motor bridge moving
Four 5-hp. motor rail lamps
Three 10-hp. motor pan feeders
One 25-hp. motor pan feeder
One 50-hp. motor screening plant
One 25-hp. motor screening plant
One 35-hp. motor screening plant
Two 25-hp. motor booms
One 10-hp. motor air compressor
Two 65-hp. motor car loaders
Total, 33 motors, 1,673 hp.

#### Dock D

*Transformers*

One 50-kw. transformer
One 300-kw. transformer
One 500-kw. transformer

*Connected Load*

One 300-kw. rotary converter
One 500-kw. rotary converter
One 15-kw. M. G. set
Three 1,092-hp., 815 kw.
Connected Load on Direct-Current Side of Rotaries

*Section I.*

Four 185-hp. motor hoist brown towers
Four 35-hp. motor hoist brown towers
Four 6-hp. motor hoist brown towers
One 25-hp. motor hoist conveyor
One 90-hp. motor hoist conveyor
Two 7½-hp. motor hoist conveyors
One 35-hp. motor hoist conveyor
One 100-hp. motor hoist box car loader
One 35-hp. motor hoist box car loader
One 75-hp. motor hoist box car loader
One 40-hp. motor box car loader
Three 35-hp. motor transfer cars
Four 35-hp. motor stock and trolley
Eight 50-hp. motor shovels
Four 50-hp. motor bridges
Two 20-hp. motor elevators
One 15-hp. motor scraper
One 25-hp. motor scraper
One 3-hp. motor blacksmith shop
One 5-hp. motor
Total, 46 motors, 2,252 hp.

*Section II.*

Two 205-hp. motor hoists
Two 10-hp. motor hoists
Two 5-hp. motor hoists
Three 105-hp. motor conveyors
One 120-hp. motor conveyor
Three 15-hp. motor conveyors
Two 7½-hp. motor conveyors
One 20-hp. motor conveyor
One 8-hp. motor conveyor
One 55-hp. motor conveyor
One 10-hp. motor conveyor
Three 15-hp. motor shaker screens
One 10-hp. motor shaker screen
One 30-hp. motor shaker screen
One 70-hp. motor box car loader
One 7½-hp. motor box car loader
One 7-hp. motor box car loader
One 75-hp. motor man trolley
One 100-hp. motor man trolley
One 90-hp. motor car puller
One 15-hp. motor car puller
Five 25-hp. motor scrapers
One 40-hp. motor dust collector
Four 5-hp. motor ribbon drives
One 3-hp. motor air compressor
One 20-hp. motor cradle
Total, 42 motors, 1,678½ hp.

*Section III.*

4-hp. motor trolley
1-hp. motor air compressor
4-hp. motor bridges
2-hp. motor bridge
1-hp. motor bridge
1-hp. motor bridge
1-hp. motor box car loader
Two 40-hp. motor screening towers
Three 10-hp. motor screening towers
One 30-hp. motor screening tower
One 37½-hp. motor box car loader
One 27½-hp. motor box car loader
One 10-hp. motor box car loader
Total, 28 motors, 1,118 hp.
Grand total, 5,093 hp., 3,799 kw.

have been developed to the point where the housewife is today assigning a great many of her laborious tasks to her most dependable servant, "electric service." Is it not our duty to follow the kilowatt-hour beyond the meter all the way through until it has performed the task assigned it? Is not this our opportunity to make central-station service invaluable?

The customer looks to his utility to set the standard of the appliances to be sold, to make it easy for him to purchase these appliances, to service them and to give him advice concerning their proper use. Experience has taught us that we shall not do this job properly unless we have a merchandising department conducted on fundamentally sound principles. If we render the service which our customers demand, our load will naturally follow; but is it not true that if we secure the load on the principle of load building only, service will follow? The merchandising department which builds for its company the best public relations is founded on the principle of service to its customers. It is a well-known fact that utilities having the most satisfactory public relations are noted also for their successful merchandising departments.

Merchandising of appliances, based upon the principle of service rather than on gross receipts and commissions, is an absolute necessity in promoting good will toward a utility. It is the department that completes the job of utilization by carrying the kilowatt-hour to its ultimate goal—that of rendering complete service. When our customers become assured by having received such service that this is the fundamental principle of our business a public sentiment favorable to the company will be aroused which will defeat the aims of any political agitator.

## Public Utility Speakers for Ohio Schools

EMPHASIZING the fact that school students and the public generally cannot be too well informed on public utility matters, Vernon M. Riegel, State Superintendent of Public Instruction for Ohio, has sent a letter to all school superintendents in the state suggesting that they arrange for utility speakers to address student bodies. This letter was sent as a result of a conference which Fred J. Bollmeyer, director of the Ohio committee on public utility information, had with State Superintendent Riegel. Already a number of school talks have been arranged through the Ohio committee as a result.

## Knowing and Analyzing Markets for Appliances

IF ANY ONE wants to get the best results in extending the use of ranges, washing machines, toasters and other appliances, it is essential to know and analyze the market first, declares L. M. Williams, commercial manager of the Wisconsin Power & Light Company, Madison.

Considering washing machines, for example, a survey must be conducted to determine what homes do not use them already. With a list of the prospects completed, the sales plan and argument will depend on whether the washing is done by the customer, by a laundress or by a commercial laundry. The financial circumstances of the customer must be gaged to determine whether or not to emphasize a part-payment plan.

A similar study must be made for everything sold—namely, what appliances are not possessed, why the prospect should buy one and what factors will appeal most.

Solution of this problem of sales analysis can be aided greatly by every employee, since each of them comes in contact with friends who may be possible customers. If employees will keep in mind information necessary to sales work, it is relatively easy to secure it from friends or acquaintances. To be of value the information must be given to the proper person in the organization.

## Results from Experimental Farm Line in Illinois

METERS have recorded the energy used by each machine and appliance on the Illinois experimental farm line near Tolono. Prof. E. W. Lehmann, project director, has recapitulated some of the observations as shown in the accompanying tables, but attention is directed to the fact that the results are not final. The line is served by the Central Illinois Public Service Company.

TABLE I—AVERAGE ENERGY REQUIRED FOR DIFFERENT TYPES OF FARM WORK

| Operation | Size of Motor, Hp. | Work Done | Kw.-Hr. | Remarks |
|---|---|---|---|---|
| Washing | ¼ | 100 lb. dry clothes | 1.5 | Test began Aug. 10; ran for 14 weeks; six co-operators; average wash, 10 lb. of clothes. |
| Ironing | ¼ | 100 lb. clothes | 11.00 | Test over same period as washing; heating element rating, 1,650 watts. |
| Cream separating | ¼ | 1,000 lb. milk | 0.48 | Average for five months (Aug. 10 to Jan. 10) of all co-operators. |
| Pumping water | ¼ | 1,000 gal. | 2.00 | Old pumping unit—shallow well; pressure range from 35 lb. to 55 lb. |
| Grain elevating | 5 | 1 ft. lift per 1,000 lb. | 0.385 | Average for eight co-operators, 0.385 kw.-hr.; max., 0.588 kw.-hr.; min., 0.130 kw.-hr. |
| Silo filling | 15 | 1-ton cut | 0.57 | 8.1 tons per hour capacity and lift of 36 ft. ¼ in. cut. |
| Feed grinding | 5 | 100 lb. corn | 0.45 | High moisture content. Medium ground |
| | 5 | 100 lb. oats | 0.286 | Finely ground |
| Milking | ¼ | 100 lb. milk | 0.46 | Average of Jan. and Feb., 1926, using two units and nine cows. |

TABLE II—ELECTRIC RANGE CONSUMPTION (1925) OF EIGHT ILLINOIS FARMS

| Co-operative No. | No. in Family | Kilowatt-Hours July | Aug. | Sept. | Oct. | Nov. | Dec. | Installed |
|---|---|---|---|---|---|---|---|---|
| 1 | 8 | 130 | 325 | 197 | 289 | 272 | 191 | July 14 |
| 2 | 2 | 72 | 163 | 148 | 235 | 309 | 132 | July 17 |
| 5 | 8 | 137 | 219 | 222 | 295 | 342 | 248 | July 15 |
| 6 | 2 | 81 | 224 | 156 | 30 | 97 | 61 | July 16 |
| 7 | 8 | 126 | 233 | 246 | 68 | 223 | 190 | July 13 |
| 8 | 4 | 101 | 168 | 139 | 186 | 93 | 105 | July 13 |
| 9 | 4 | 139 | 288 | 297 | 37 | 98 | 92 | July 14 |
| 10 | 11 | 148 | 223 | 220 | 226 | 229 | 272 | July 16 |
| | 47 | 934 | 1,843 | 1,625 | 1,366 | 1,663 | 1,291 | |

Note.—Average kilowatt-hours consumption per person per month for all eight co-operators over five months (August to December inclusive) was 33. The highest average was 98 kw.-hr per person per month for a family of two, and the lowest was 20 kw.-hr. per person per month for a family of eleven.

TABLE III—REFRIGERATOR CONSUMPTION (1925-1924) OF SEVEN ILLINOIS FARMS

| Co-operative No. | Kilowatt-Hours Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Location | Installed |
|---|---|---|---|---|---|---|---|---|
| 3 | .. | 24 | 21 | 14 | 14 | 10 | Pantry cool | Sept. 16 |
| 4 | 16 | 40 | 33 | 26 | 20 | 21 | Dining room warm | Aug. 18 |
| 5 | 73 | 62 | 25 | 42 | 34 | 38 | Dining room warm | July 28 |
| 6 | 23 | 52 | 34 | 30 | 27 | 32 | Dining room warm | Aug. 12 |
| 7 | 41 | 21 | 29 | 25 | 21 | 22 | Pantry warm | Aug. 15 |
| 8 | 99 | 98 | 48 | 40 | 34 | 33 | Pantry cool | Aug. 1 |
| 9 | .. | 13 | 30 | 24 | 21 | 30 | Pantry cool | Sept. 17 |

Note.—The average energy consumption for refrigeration per family per months for the above installation from September to January, inclusive, was 31.1 kw.-hr. The average for September was 44.3 kw.-hr. and for January 26.5 kw.-hr.

# Digest of Electrical Literature

## Hydro-Electric Development and Steam Equipment

*Heat Insulation.*—R. H. HEILMAN.—Heat losses from steel pipes of various diameters were determined experimentally and the saving with insulated pipes was computed in terms of efficiency and of money, as well as the time required to repay the original cost out of the reduction in heat losses. The resulting information is presented in the form of curves and tables worked out for various fuel costs.—*Engineers and Engineering*, Aug. 15, 1926.

*Electrical Developments in South Australia.*—E. V. CLARK.—Power developments in South Australia are in marked contrast with those in British North America, which were described in the three preceding articles of this series. Possible sources of water power in the state are very scanty, and none has yet been developed, nor does the state produce either coal or oil. South Australia is thus dependent for large supplies of power upon imported coal, which comes almost entirely from New South Wales and is of good quality. The largest station is at Port Adelaide, with a present installation of 30,000 kw. of generating equipment. It serves a population of about 290.000 within a 10-mile radius.—*World Power*, July, 1926.

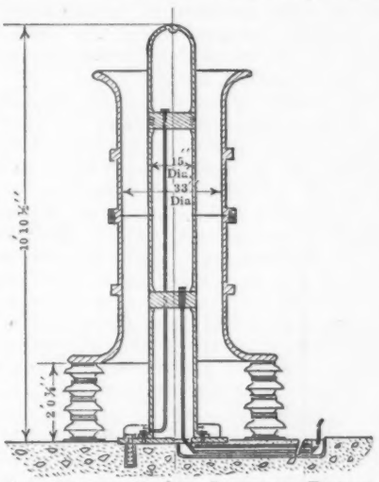
## Generation, Control, Switching and Protection

*Operation of Voltage Regulators for Alternating-Current Generators.*—W. H. TURNER.—This paper gives the principles on which voltage regulators operate, describes the functions of the direct-current and the alternating-current systems in the regulator, discusses the adjusting of regulators to hold constant exciter voltage or constant alternator voltage and concludes with suggestions for the care of the regulator.—*Power*, July 27, 1926.

*Changing of Transformer Taps Under Load.*—D. I. SESSINGHAUS.—The voltage regulation in transformer substations makes it desirable to change the transformer ratio of the installed machines under full load. Several methods are indicated which permit such a change by using an auxiliary transformer in series with the feeder. A second shunt transformer with taps impresses upon the low-voltage winding of the series transformer various voltages of the same or opposite polarity, resulting in either boosting or bucking of the feeder voltage. The change from one point to the next is accomplished either with knife switches or a spindle-driven straight-line switch. In either case split brushes with resistances are required to minimize arcing. Vectorial diagrams indicate the phase conditions for every method described. The systems are very complex and seem to be useful only for voltages not exceeding 10 kv. and for small capacities. No mention is made of the mechanical features of the arrangements, and it appears as if the entire paper would deal with the subject only from the theoretical standpoint.—*Elektrotechnische Zeitschrift*, July 8, 1926.

## Units, Measurements and Instruments

*Use of the Schering Bridge at 150 Kv.*—B. G. CHURCHER and C. DANNATT.—The measurement of energy loss in insulating materials is difficult when very small power and high voltages are involved. During the last few years much attention has been paid to bridge methods for this purpose. In these methods the power loss in the apparatus under test is not directly measured, but the capacitance and power factor are determined in terms of a standard and the energy loss is then deduced, the applied voltage and frequency being known. Of the many bridges so far developed, the Schering bridge is the most suitable for high-voltage work. The present article discusses some problems that arise in its construction and operation. One of these lies in the design of the air condenser, of which the concentric-cylinder type developed by Petersen is regarded as the most satisfactory. A form which was found to be safe against sparkover is shown in the figure. The electrodes were made of special iron castings and machined, the joint being carefully scraped to give a smooth finish. The discussion of the accuracy of the method and of the factors affecting it goes into some detail. It is evident that the air condenser is completely pure up to 130 kv., but that at 150 kv. the power factor has increased though it is still within 0.001.—*World Power*, May, 1926.



AIR CONDENSER FOR SCHERING BRIDGE

*Accuracy Required in the Measurement of the Dielectric Power Factor of Impregnated Paper-Insulated Cables.*—BY C. F. HANSON.—In the measurement of the various properties of a commodity errors exist which impose limitations on the obtainable accuracy. An error in the measurement of some one property, therefore, need not be made as small as possible, but need be reduced only to a value which will impose very little additional limitation upon the usefulness of the commodity. In the case of paper-insulated cables the thermal properties of the cable and of the cable duct are the least well-known items. Errors in the latter affect the usefulness of a cable to such an extent that a limited error in the power factor is of relatively slight significance. The required power-factor accuracy in general is found to vary directly with the frequency and the specific inductive capacity of the insulation, and to increase with the number of cables in a duct bank and the ratio of $E^2/G$, where $E$ is the operating voltage of the cable in kilovolts and $G$ is the geometric factor. For very high-voltage single-conductor cables the power-factor accuracy should be within the order of 0.002. Several illustrative cases are worked out, showing under what conditions the temperature of a cable may continue to rise indefinitely after a certain critical temperature has been reached, even though the current be then reduced below the critical value. It is shown that under certain conditions a slight error in the power factor, of the order of 0.002, will make the difference between success and failure, whereas in another case with somewhat different thermal constants a similar error will be of little importance.—*Journal A.I.E.E.*, August, 1926.

## Transmission, Substations and Distribution

*Economic Limit of Power-Factor Correction.*—A. R. STEVENSON, JR.—The financial losses due to lower power factor are twofold—First, low power factor prevents the full utilization of the system for the generation and transmission of power; second, it increases the resistance losses per unit of energy. Over against this it costs money to improve the conditions. Hence the correction in general necessitates the purchase of condensers, either rotary or static. Clearly the economic optimum is attained when the total annual expense is a minimum. This problem is investigated mathematically by the author, and an equation is derived based on certain assumed unit costs. The solution takes the form of a determination of the kva. of condensers to be installed in order to bring the power factor from its initial average value to that value which gives the most economical operation. The theory of the method is worked out in an appendix.—*General Electric Review*, Aug. 2, 1926.

## Illumination

*Use of Color for the Embellishment of the Motion-Picture Program.*—L. M. TOWNSEND and L. A. JONES.—The first part of the paper deals with a method for producing dynamic color effects by the use of two projectors of the stereopticon type with slides having complementary patterns. Mobility is produced by filters of various colors. The last part gives suggestions on methods

of using stereopticon spot and flood lights.—*No. 237, Publications from Eastman Kodak Company Research Laboratories*, 1925.

*Incandescent Tungsten-Lamp Installation for Illuminating Color-Motion-Picture Studio.*—L. A. JONES.—Where color motion pictures are to be made, the mercury-vapor lamp is practically useless because the spectrum is of the discontinuous or bright-line type; electric arcs are somewhat variable in intensity and require frequent attention; tungsten lamps are clean and convenient but relatively inefficient and therefore give rise to uncomfortably high temperatures. The paper describes tests made with incandescent lamps ranging in size from 1,000 watts to 10,000 watts, the 3,000-watt unit being finally chosen as most suitable. Illustrations show the arrangements used. —*No. 238, Publications from Eastman Kodak Company Research Laboratories*, 1925.

## Heat Applications and Material Handling

*Protecting Thermocouples by Transparent Silica Tubes.*—R. A. RAGATZ and O. A. HOUGEN.—Although ordinary fused silica tubes permit contamination in reducing atmospheres, the translucent tubes do not. It is believed this contamination is caused by the porosity of translucent silica, which permits the penetration of reducing gases to the interior of the tube. When heated for extended periods above 1,050 deg. C., such tubes rapidly devitrify and crumble. Because of the recent development of a new fused-silica protection tube of the transparent type, it was deemed desirable to perform similar tests upon this new type of material. Two types of couples were used in these tests, a base metal couple of chromel-alumel and a noble-metal couple of platinum against platinum with 10 per cent rhodium. Visual examination of the transparent protection tubes after each heat treatment showed no alteration except for the tubes heated at 1,200 deg. C. In this case slight surface devitrification was noticed after the end of the first 50-hour period and was more pronounced at the end of 100 hours.—*Chemical and Metallurgical Engineering*, July, 1926.

## Motors and Control

*Graphical Theory of the Polyphase Synchronous Motor.*—H. COTTON.—The operation of two synchronous generators working in parallel or of a synchronous motor working in parallel with a generator can be expressed by a well-known form of the circle diagram. This diagram and the reasoning which underlies it the author subjects to further analysis. He shows, for instance, that the lines of constant electrical output are circles and on this basis deduces certain other characteristic curves. Among other things, he works out equations or charts for determining the necessary excitation to enable the motor to perform a required amount of power-factor correction, for finding the effect of line resistance, and for indicating the conditions for successful parallel operation of generators.—*World Power*, June and July, 1926.

## Electrophysics, Electrochemistry and Batteries

*Electrical and Photo-Electric Properties of Thin Films of Rubidium on Glass.*—HERBERT E. IVES and A. L. JOHNSRUD.—Films which spontaneously deposit on glass surfaces in a highly exhausted cell containing rubidium are electrically conducting and photo-electrically active. A study of the photo-electric properties of a rubidium-coated plane-glass surface shows the normal and selective effects less well differentiated than for the similar coatings which form on metal plates. A rubidium film formed on the inside of a glass cylinder is found to exhibit, in the dark, a pure omhic resistance. This decreases under illumination in a manner which appears to be explained as due to the liberation of photo-electrons, which under a potential gradient form an added current along the tube.—*Bell Telephone Laboratories Reprint B-183*, February, 1926.

*Electrical Properties of Copper-Nickel Resistance Alloys.*—SKEZUG KIMURA and ZUNEHACHI ISAWA.—The authors have determined the relation between the electrical resistance and the chemical composition of copper-nickel alloys as well as the variation with temperature. The latter was measured from —200 deg. to 800 deg. C. for alloys of various nickel content, and it was found that the resistivity temperature curve of the alloys in a certain range of nickel content has one maximum and one minimum. While the experimental results are regarded as insufficient to establish a definite theory, a relationship is found between the change in temperature coefficient of the alloys and the transformation point of nickel.—*Researches of Electrotechnical Laboratory, Tokyo, Japan*, May, 1926.

## Telegraphy, Telephony, Radio and Signals

*Behavior of Radio Receiving Systems to Signals and to Interference.*—LEO JAMES PETERS.—This paper develops a point of view and method by means of which it is possible to arrive at many of the transient effects occurring in radio systems by a consideration of steady-state properties alone. The scheme is to replace the voltages in radio receiving systems due to interference and signals by a group of generators having the correct voltages and frequencies. These generators can be thought of as having been in the circuit for an indefinitely long time, so that only the steady-state response of the system need be considered. The generators which replace the voltages induced in an antenna by interrupted continuous-wave stations, by spark-telegraph stations, by telephone stations and by static are worked out. The desirable properties of radio receiving systems for receiving various types of signals through interference are arrived at, and an ideal system is described which may be used as a standard of reference for judging the merits of any actual frequency-selecting system. It is shown that this ideal system reduces the interference from all sources to the smallest possible value which can be obtained in a system which makes use of frequency selection to reduce interference. The paper thus arrives at the degree to which interference can be mitigated by frequency-selection methods. In order to illustrate the method of treating actual systems, calculations are given for a simple series receiver. The interference caused by transmitting stations of various types and by static is discussed, and the factors determining such interference are pointed out. —*Journal A.I.E.E.*, August, 1926.

## Traction

*Electric Battery Locomotives for Mines.*—A prize was offered for the best locomotive to meet certain specified requirements, such as 2-ft. gage, 13-ft. turning-radius, 600-lb. drawbar pull and a speed of 3½ miles per hour. The successful design is briefly described. It is a two-axle locomotive with an inner frame carrying an 8-hp. motor geared to one of the wheel axles, the latter being coupled to the other axle by means of outside connecting rods.—*Engineering (England)*, July 30, 1926.

*Electrical Equipment of Motor Ship.* —E. SCHMIDT.—The electrical equipment of a new single-crew motor freighter is described and illustrated. It includes generating plant, auxiliary engine-room equipment, auxiliary deck equipment, switch gear and power and lighting circuits.—*A.E.G. Progress*, July, 1926.

## Miscellaneous

*Noise-Testing Methods.*—KURT LUBOWSKY.—In specifications dealing with electrical machinery stress is frequently laid on noiseless operation. It therefore becomes necessary at times to determine the cause of a noise, either with a view to applying remedial measures, in case of a specific machine, or of modifying the design. Confining his attention to those noises which are due to periodic disturbances of acoustical frequency—that is, which give rise to a musical note—the author divides the causes into four groups: (1) Mechanical; (2) siren effects, often connected with the ventilation of the machine; (3) thermal, caused by periodical heating of parts of low thermal capacity; (4) magnetic. Aural methods are, in general, useful only in a qualitative way. They can be made quantitative by the use of null methods in which the noise is imposed on a microphone and passed through a transformer to a high-resistance telephone receiver with an adjustable shunt, the resistance of the latter being reduced until the note heard in the telephone disappears. An objective method which does not depend upon the sensitivity of the ear makes use of the combination of a microphone, an amplifier and an oscillograph. The limitations of this method are discussed and a number of practical applications are described, illustrated with reproductions of oscillograms.—*A. E. G. Progress*, June, 1926.

# News of the Industry

## To Set up Wiring Standard

**Electragists Vote to Promote Higher Requirements by Contractors than Those Now Recognized**

THE Association of Electragists International at the largest convention in its history, held on Aug. 24-27 at Cedar Point, Ohio, and reported in part last week, unanimously voted at the final session on Friday to develop, establish and promote "an Electragist standard for wiring installations." This vote followed the presentation of an argument by Arthur L. Abbott, technical director of the association, and a general discussion by a very full meeting, which expressed a strong sentiment that, although the National Electrical Code establishes a minimum standard for safety and the "red seal" plan is promoting a higher standard of adequacy for residential installations, there exists today no recognized standard that will influence electrical contractors to a higher quality of work and tend to educate the smaller contractor away from the present too prevalent self-destructive practice of price competition.

The association placed itself clearly on record as pledged to the defense and development of the National Electrical Code, and the executive committee passed a resolution approving "the present position of the A.E.I. in connection with unarmored assemblies" and voting to "continue to oppose the approval of Section 507 [relating to non-metallic sheath cable] of the 1926 N.E.C. supplement by the American Engineering Standards Committee until same has been revised by the National Fire Protection Association in accordance with proposed compromised rules which can meet with a greater unanimity of opinion and acceptance for field practice."

George E. Shepherd presented a paper discussing the present status of state and municipal licensing of electrical contractors. This was discussed at length, the discussion culminating in a unanimous vote by the association indorsing the principle of licensing of contractors.

## Fourth Turbo-Generator at Kearny in Service

The fourth of the five big electric generator units that will equip the first section of the new Kearny (N. J.) generating station of the Public Service Electric & Gas Company was put into service on Aug. 20. It has a capacity of 43,750 kva. and brings the total present capacity of the station up to 165,900 kva. The last unit, work on the installation of which is progressing rapidly, will have a capacity of 39,200 kva., so that the final capacity of this section will be 205,100 kva. Features of the Kearny station were described in detail in the last week's ELECTRICAL WORLD (page 415).

Since Jan. 1 the total generating capacity of the company has been increased by 118,050 kva. or more than one quarter, and on Dec. 31 next it will be double that of Dec. 31, 1921, five years ago. New Jersey's industrial and domestic demands are absorbing this increased power almost as fast as it is rendered available.

## Brooklyn Edison's 80,000-Kw. Unit Started Up

On Wednesday, Sept. 1, the new Westinghouse 80,000-kw., 90-per-cent-power-factor cross-compound turbo-generator of the Brooklyn (N. Y.) Edison Company went into service at the company's Hudson Avenue station. This machine, which cost more than $1,000,000 to build and install, has, the manufacturer asserts, a higher rating than any other turbo-generator so far in operation. Its over-all length is 64 ft. 6 in. and the entire unit weighs more than 1,000 tons. The new equipment also includes an 80,000-sq.ft. Westinghouse surface condenser of the two-pass radial-flow design, also the largest of its kind yet built. A detailed description of the new generator is printed in this issue (page 465).

## First Unit at Martin Dam Goes Under Test

The first 45,000-hp. unit at Martin Dam, the Alabama Power Company's new hydro-electric station at Cherokee Bluffs on the Tallapoosa River, was put into operation Monday of this week for the purpose of test. This initial test proved satisfactory in every way. The machine will be under test for a number of weeks before final acceptance. Under present plans the second unit of the same capacity will begin its test run in the latter part of September, and about Jan. 1 the three initial units, with a capacity of 135,000 hp., should be in regular operation on the company's system. The ultimate capacity of the project when finally completed will be 180,000 hp.

## Leagues Launch Market Development Plan

**Comprehensive Scheme Drawn Up by Council Already Indorsed in Principle by the Society for Electrical Development and Many Central-Station Executives**

A NATIONAL program for co-operative market development that provides for the ultimate co-ordination of all national campaigns apllied to local activity for the promotion of commodities or products was announced and submitted for approval of the electrical industry at the fifth annual conference of representatives of local electrical leagues, this week, when representatives of these leagues gathered from all parts of the country at Association Island, Henderson Harbor, N. Y. This program has been developed by the League Council, of which J. E. North of Cleveland is chairman. It was drawn up in response to a resolution passed at Camp Co-operation V last year in which the League Council was directed to study the market development problems of the industry in relation to the league organization and operation.

The plan advocated by the League Council calls for a direct affiliation of the local electric leagues of the country with the Society for Electrical Development in a chapter relationship in which the headquarters and field service that in the past have been rendered independently by the society to the individual leagues, with the League Council acting in an advisory capacity, will be brought under the control of official representatives of the leagues, and the leagues in turn will take a charter from the society carrying with it responsibility for the maintenance of certain fundamental national policies as adopted by the national directorate established by the leagues themselves, the leagues preserving meanwhile complete autonomy in so far as their local purposes and activities are concerned. Supporting this organization is a financial program intended to simplify greatly the present method of supporting independently the local work of the individual leagues of the various cities and the national work that is being done by the Society for Electrical Development both in league service and in the promotion of commodity campaigns for groups of manufacturers under the present practice.

The details of the plan were not available for publication in time for this issue, but will be presented next week. The detailed plan as submitted has received the indorsement in purpose and in principle of the board of directors of the Society for Electrical Development and the advisory publicity council. An informal and unofficial meeting of about twenty-five central-station executives called together recently in New York by W. W. Freeman, president of the S. E. D., has also indorsed it, as have local leagues before whose membership it has been presented. The league conference in session this week also voted indorsement

of the plans. The league representatives present were not empowered to commit their leagues to acceptance of the League Council program, nor were they requested to, the purpose being to refer the plan back to the local league officials for study and later action when the details have been thoroughly interpreted and possible refinements have been evolved.

Camp Co-operation VI was the largest as well as the most representative gathering of league men so far held. Well over three hundred delegates were in attendance, speaking for 72 leagues. Monday and Tuesday were devoted to meetings of the League Council, the advisory publicity council, the advisory committee of the Associated Manufacturers of Electrical Supplies, the directors of the Society for Electrical Development, the "red seal" plan licensees and the officers and managers of Class A leagues.

The camp was officially opened on Wednesday with a flag address by J. Robert Crouse, president of the Nizer Corporation and founder of the Society for Electrical Development. The program, culminating in a banquet on Saturday night, included addresses by notable speakers. Among them were Don C. Seitz, director of the *Outlook*, and Dr. Louis E. Stanley, chief of the Bureau of Home Economics of the United States Department of Agriculture. The business sessions reviewed the full scope of present league activities and the relationship of the leagues to current industry movements.

The total number of leagues has now reached 140, a growth of 24 local organizations since the last conference.

## Tampa Electric Company Has Share in Florida Growth

The 1926 program of power-plant enlargement adopted by the Tampa (Fla.) Electric Company, which involved a total expenditure of $1,500,000, will reach completion Sept. 15, when a new Westinghouse turbo-generator developing 12,500 kw. will be put into operation. The work was begun in the latter part of last December. Auxiliary equipment is already in place. This addition will increase the capacity of the plant to 35,500 kw., according to Manager T. J. Hanlon. To care for the additional load four new substations have been built and two are still under construction in addition to the five in use at the beginning of the year. The plant, which is on the Hillsborough River, has been enlarged and a stack 225 ft. high has been completed, making three stacks in all.

The growth of electrical demand in this as in other parts of Florida has been so great that the Tampa Electric Company is having difficulty in building fast enough. In December, 1924, when a 10,000-kw. unit was completed, it was believed no more would be needed for at least two years. The plant has now reached its possible capacity. Several months ago the company announced that a site for a future plant on the Alafia River, 10 miles southeast of the city, had been purchased. Plans for this plant are still indefinite, Mr. Hanlon said. The growing demand is proved by the fact that the company's output for the fiscal year ending June 30 was 74,344,000 kw.-hr., as compared with 42,973,000 kw.-hr. for the preceding year.

Besides serving Tampa, the Tampa Electric Company supplies power to Mango, Seffner, Dover, Plant City, Mulberry, Eagle Lake, Florence Villa and Winter Haven. An interconnection has recently been established with the plant of the Pinellas County Power Company at St. Petersburg for mutual protection. The Tampa company is a Stone & Webster property.

## Strife Over Control of Adirondack Streams Renewed

The proposed creation of a regulating district on the Salmon River in the Adirondack Mountain region of New York State has again caused strife to break out between those who see in the control of the flow of mountain streams by means of storage basins a necessary action to prevent floods in adjoinng towns and on farm lands and those who deem such regulating districts a means to hide power projects, to which they are violently opposed. The opponents of the Salmon River proposal, who take the latter view, say that an attempt is being made to establish a precedent under which power interests may establish similar districts at small cost for the Saranac, Racquette, St. Regis, Ausable, Chateaugay, Oswegatchie and Grass Rivers, all in the Adirondack district and flowing through state lands.

Representatives of the Association for the Protection of the Adirondacks, the Saranac Lake Chamber of Commerce and the Adirondack Civic League appeared in opposition to the application when it came before the State Water Control Board at Albany on Sept. 1. Harry C. Wilder, president Malone Light & Power Company, advocated the plan, as did John N. Carlisle, president Northern New York Utilities, Inc. Mr. Wilder said it would make available 12,000 additional horsepower. The hearing was adjourned to Oct. 5. A similar application affecting the Racquette River was withdrawn two years ago after strong opposition.

## Dominion and Provincial Governments Agree Over Niagara

An agreement has been reached between the Canadian government, the Ontario government and the Ontario Hydro-Electric Power Commission in regard to water-power diversion in the Niagara district and its effect upon navigation. C. A. Magrath, chairman of the Ontario Hydro-Electric Power Commission, explained that the agreement would permit the diversion of water in the Niagara district, but added that this would not in any way interfere with navigation. The agreement is drawn up in keeping with the provisions of the treaty now in force. In regard to the diversion in the Welland River, 10,000 cu.ft. per second has been specified. In place of the "quantity" of water, its "velocity" is being limited.

## Wants City to Buy Power

### Cleveland's Director of Public Utilities Finds Municipal Plant Gravely Handicapped

FAILURE of Cleveland's municipal lighting plant to show operating economies may be seen in a public statement this week by Howell Wright, city director of public utilities, in which he advocated that the city should purchase a considerable part of its power requirements rather than continue operating some of its present generating equipment, which has become highly uneconomical. Denying that he was in favor of selling the municipal plant, Mr. Wright explained his stand as follows:

"Superpower systems are covering the entire country to such an extent that it is obvious they can produce energy more cheaply than our municipal plant. I am told that the Cleveland Electric Illuminating Company, at its Avon plant, will get one kilowatt-hour out of a pound and a half of coal, while the best we can do is a kilowatt-hour out of a pound and ninety-three-hundredths, although with some new equipment we may be able to get the same out of a pound and three-quarters. Therefore I believe, and shall so urge upon the city manager, that we consider at once buying the energy for our base load, at a lower cost than we can generate it, using our own equipment for peak loads and spares.

"The municipal light plant already has accomplished the purposes for which it was created—first, to serve as a basis for rate regulation; second, to provide some competition, and, third, to supply a large number of our citizens."

Saying that City Manager William R. Hopkins does not favor placing a lighting-plant bond issue on the ballot this fall because of other projects that the city is now financing, Director Wright continued:

"That means we must wait a year to get a vote of the people, and it would be another year before we would have $500,000, the sum needed for improvement. What to do in the meantime, then, becomes the question, and buying energy for our base load is my answer."

Mr. Wright also said that the city plant was handicapped by bad design and the necessity of paying higher wages than its competitors. He thought it had a great future for municipal purposes and street lighting, but held that the city would benefit from becoming "in a way" part of the territory of the great superpower system serving Ohio. In support of this stand he said:

"The other day, I am told, a plant down near the Ohio River went wrong. It is connected with this superpower system, and the Cleveland Electric Illuminating Company was able to pick up service and carry peak load for the plant in half an hour."

Despite Mr. Wright's statement, it is not expected in well-informed circles in Cleveland that the city will take any immediate steps for the purchase of energy.

# Basle Meeting of World Power Conference

## Opening Sessions of Sectional Gathering Held This Week—American Papers on Rural Electrification and Relations Between Steam and Hydraulic Generation

ASSEMBLING at Basle, Switzerland, on Tuesday, Aug. 31, the sectional meeting of the World Power Conference, of which the ELECTRICAL WORLD printed particulars on June 26 (page 1411) and Aug. 7 (page 288), listened this week to discussion on a number of the scheduled papers from the delegates of 29 nations. The American delegates were headed by O. C. Merrill, chairman of the United States committee. Two of the American papers already released are that of Dr. E. A. White on rural electrification and that of William E. Mitchell, vice-president Alabama Power Company, and Prof. John M. Gallalee, University of Alabama, on the economic relation between energy produced by water power and energy generated by steam.

Dr. White summarized the benefits of electrification of farms as five in number—improved living conditions, increased production per worker, reduction in operating costs, improved quality of product, and insuring the doing of the right thing at the right time. After sketching the formation in the United States of the Committee on the Relation of Electricity to Agriculture, its functions and its growth to include 20 state bodies, Dr. White said:

"In the last analysis we are more concerned with systems of farming than with specific operations, but before this structure can be erected the foundation must be laid, the bricks made and other necessary units fashioned. For these reasons there is a feeling in the United States that with some notable exceptions, such as irrigation farming, rural electrification still may be looked upon as an experiment, not as to its ultimate desirability or coming, but as to the changes in our agricultural system which its general introduction will bring.

"It is most gratifying to report that electric light and power companies of the United States are giving constructive attention to rural electric service development. Nineteen operating companies have one or more men devoting full time to this class of service. Some of these companies are organizing rural service departments, thus giving the work the same recognition as is accorded other classes of business. The character of the effort being expended in this direction promises to place rural electric development on a sound and aggressive basis."

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O. C. MERRILL

W. E. MITCHELL

E. A. WHITE

### STEAM AND WATER POWER

The authors of the paper on the economic relation between steam-produced and hydraulically produced electric power presented extensive data, from which they drew the following conclusions:

"Many different factors effect the economic balance between thermal and hydraulically produced electrical energy. No general rules can be laid down. Each system or group of systems presents its own peculiar problems. The number, size and availability of hydro-electric sites and the necessity of developing them as a matter of public policy and fuel conservation may frequently outweigh any temporary advantage there may be on the side of the thermal plant.

"On the other hand, the advancement in the art, the immense improvement in boiler and turbine efficiencies, the possible development of the mercury turbine all tend to make the thermal plant a producer of energy at as low unit costs as all except the most favorably located hydro-electric plants. As long as coal is the prime source of heat the thermal plant faces the certainty of increasing costs so far as this item is concerned.

"For the territory with which the writers are most familiar, it would seem that for the next ten years, at least, the cheapest over-all cost of energy will be attained by developing the hydro-electric plants considerably beyond their primary power capacity and supplementing these by economical steam plants located either at mine mouth or at important load centers."

An extract from the authors' observations as to interconnection and frequency control is as follows:

"The Alabama Power Company has installed a 25,000-kva. turbo-generator at its Gorgas steam plant with provision for disconnecting the generator from the turbine and operating the generator as a synchronous condenser. This is especially desirable since in the wet season the steam plants are shut down, and as the hydro plants are located in the opposite section of the system, operation of the generators as condensers materially improves conditions throughout the system. During the dry season hydro generators are floated for power-factor correction. By shutting the wicket gates and breaking the vacuum in the draft tube on the machine it is possible to operate generators for power-factor correction with only a small loss of water. This same practice is, of course, followed by other companies on the interconnected network, and the system supplying energy is relieved, in so far as possible, of excess reactive component by systems receiving the energy, those systems using their spare generator capacity for power-factor correction. Although without doubt the proper place for the major part of power-factor correction is at the customer's load, a certain amount of correction is necessary in large load centers where large-capacity condensers can be installed and definite control of voltage conditions can be secured.

"In general 110,000-volt oil circuit breakers are used for synchronizing purposes. Inherently, these breakers re slower than the low-voltage breakers in generating stations; however, with a little practice the operators are able to synchronize systems with no adverse effect to either of the systems. Of course, it is necessary to check circuit breaker adjustments carefully so that at all times they will close as quickly as possible.

"To operate successfully the transmission systems in parallel and at the same time secure the proper load adjustments between the various generating stations and between the systems themselves, it is essential that the frequency be rigidly maintained at 60 cycles. It has been found that the regulation of frequency must be controlled by the base-load stations and especially the base-load station of the system supplying the bulk of the power, all other stations making the necessary governor adjustments to fall in step. The governors at all stations taking the load fluctuations should be equally sensitive so that all systems can properly carry their share of the fluctuations.

"On the system of the Alabama Power Company the base load is carried by the hydro plants and load fluctuations by steam plants in the wet season and vice versa in dry seasons. During the wet seasons, therefore, the frequency is controlled at Lock 12 and Mitchell Dam, and in dry seasons it is controlled at the Gorgas steam plant. Master clocks are installed at both stations for the purpose. There is no appreciable difference in the manner in which the hydro and steam stations handle load fluctuations."

The authors dwelt also on the effective relay protection essential in the operation of interconnected systems.

## Ohio Edison's Coming Station on Mad River

Substantial progress is being made in the construction of a steam-electric central station on Mad River, west of Springfield, Ohio, for the Ohio Edison Company. Concrete and steel work is under way, and bricklaying will begin about Oct. 15. It is expected to have the plant under roof by Jan. 1, 1927, and in operation by next August. The steam turbines will be shipped March 1 and will require 60 days for erection. The first unit of this plant will be a 20,000-kw. modern turbo-generator, according to C. I. Weaver, vice-president and general manager of the company. The building to house this unit and the boilers will be approximately 100 ft. square and about 70 feet high. There is sufficient water at this site to permit the installation of five such units.

The present Rockway station of the Ohio Edison Company will be maintained as a reserve power plant, according to Mr. Weaver. It will also be used through the winter months as a heating plant and as a switching station for certain of the circuits. A new switch house at the Rockway station is nearing completion, and by the first of October all power circuits will be connected through this station, materially safeguarding and improving the service so far as interruptions are concerned. The new switch house also contains voltage regulators. Erection of the Mad River power plant will insure an adequate power supply for Springfield and surrounding territory for a number of years to come.

## Wisconsin Commercial Men to Meet at Green Lake

The meeting of the Electrical Section of the Wisconsin Utilities Association at Eau Claire this week will be followed by a two-day meeting of the Commercial Section at Green Lake on Sept. 9 and 10. Between 100 and 125 heads of commercial departments of utility companies from all sections of the state are expected to attend.

L. M. Williams of the Wisconsin Power & Light Company, Madison, who is chairman of the section, announces completion of the program. There will be papers and discussions on rural electrification, advertising, public relations, electrical heating and relations and co-operation with electrical contractors. On Thursday morning, Sept. 9, C. A. Dow, Eau Claire, chairman of the dealers' relations committee, will speak on "Better Relations with the Contractor-Dealer," and a discussion on co-operation will follow. H. W. Beckwith of the Milwaukee Electric Railway & Light Company will open the Friday morning session with an address on "The Electrical Heating and Cooking Situation." Mrs. Katherine Delaney of the Wisconsin Public Service Corporation will lead a discussion on "The Real Plan and Purpose of Home Service"; F. H. Evans will discuss electrical merchandising; "Who Polishes Your Door Knob?" will be the topic of C. B. Batman, Westinghouse company; "Utility Merchandising Advertising" that of Dempster MacMurphy, Middle West Utilities Company, and "Rural Electrification" that of G. C. Neff, Wisconsin Power & Light Company.

A playlet showing the benefits of home service departments, the cast consisting of department heads, will be a novel feature of the convention.

## Brazos River, Texas, May Yield 275,000 Hp.

Hydro-electric projects which involve the development of a total of 275,000 hp. are planned for the Brazos River and its tributaries, according to reports just made and data collected by A. H. Dunlap, a member of the State Board of Water Engineers. On a number of the sites surveys have been completed, and Mr. Dunlap is of the belief that at least three-fourths of the projects will be successfully carried to completion.

The plans call for the construction of seven large reservoirs, besides numerous channel dams. The various projects on the main Brazos call for a total horsepower of 228,000, as follows: Mineral Wells, 17,000 hp.; Inspiration Point, 9,000 hp.; from Inspiration Point to De Cordova Bend, 8,000 hp.; De Cordova Bend, 15,000 hp.; Rainbow Bridge site, between Glenrose and Cleburne, 5,000 hp.; Bee Mountain, between Johnson and Bosque Counties, 17,000 hp.; from Bee Mountain to Waco, by a series of channel dams, 26,000 hp.; Waco to the mouth of Little River, 40,000 hp.; from the mouth of Little River to College Station, 20,000 hp.; from College Station to Hidalgo Falls, inclusive, 30,000 hp.; Hidalgo Falls to Sealy, 40,000 hp. Projects on tributaries of Little River include the Leon River, near Belton, 11,000 hp.; Lampasas River, near Belton, 6,000 hp.; from the mouth of Little River to the mouth of the San Gabriel River, 22,000 hp.

## Only Six Municipal Generating Plants in South California

Total gross receipts for the 22 municipally owned electric light plants of southern California last year were $12,986,000, according to the annual report of municipal and county financial transactions just made public by the State Controller. Of this sum $9,319,999 went for operating expenses, leaving a balance of $3,666,001. Only six of the 22 municipalities in the electric light business generate their own electricty, the report shows. They are Los Angeles, Pasadena, Alameda, Riverside, Palo Alto and Avalon. The others, which buy electricity wholesale and retail to their consumers, are Glendale, Anaheim, Santa Clara, Lodi, Roseville, Colton, Burbank, Redding, Azusa, Healdsburg, Ukiah, Lompoc, Banning, Gridley, Biggs and Tehachapi. Los Angeles city is the largest of these plants, with a gross revenue for 1925 of $9,209,101, operating expenses $7,105,260 and a net balance of $2,103,841. The Los Angeles system had 207,746 consumers at the end of June, 1926, while the plant and system were valued at $39,256,861.

## Congress of American Industry Meets Next Week

The Commercial Museum in Philadelphia will be the scene this month of a Congress of American Industry, which will last from Sept. 7 to Sept. 24 inclusive and is designed to show the advantages of the American system of government and the industrial progress arising from it and to permit an exchange of ideas "that will establish confidence and co-operation, resulting in perpetuity of purpose." An industrial exhibit portraying the progress of 150 years is being arranged. Appropriate papers will be presented for inclusion in the printed proceedings, and brief discussions will be held.

Two addresses will be made on each of twelve days—one in the morning and one in the afternoon—among the scheduled speakers being Secretaries Hoover, Wilbur and Davis, Dean Dexter S. Kimball, General Guy E. Tripp (whose subject is "Power and Its Distribution"), W. C. L. Eglin ("Illumination"), John J. Carty, Albert L. Salt, Charles Piez, Thomas E. Mitten and other well-known men. Ernest T. Trigg, president John Lucas & Company, is chairman of the congress.

## Transmission Towers Saved from Erratic Mississippi

Successful "throwing" of the channel of the Mississippi River about 2,000 ft. at Crystal City, Mo., thus saving the overhead electric transmission line of the Union Electric Light & Power Company, erected at a cost of $250,000, and protecting $1,000,000 worth of other company property, was announced by officials of the company on Aug. 27 following a trip to inspect the work accomplished the previous day. Aboard a river steamer these officials in company with Major John C. Gotwals, United States district engineer, went to Crystal City to inspect the "crossing" which carries power from the Cahokia power plant of the Union Electric, on the Illinois shore, to the plant of the Pittsburgh Plate Glass Company and other consumers in the Crystal City district.

The main span is 5,000 ft. long and is supported by towers 300 ft. high. The Missouri tower is solidly set on a stone cliff, but the Illinois tower is on soft ground washed up by the river from time to time and is backed by a second span 2,700 ft. long leading to the Illinois bluffs. Originally the main Illinois tower was constructed 650 ft. from the Mississippi River, but about a year ago the erratic Father of Waters started to dig a new channel there, and gradually the Illinois shore was eaten away until the water was but 30 ft. from the Illinois tower. Engineers for the Union Electric interested Major Gotwals in efforts to save the electric company's property, and a series of hurdle dikes were constructed to swing the channel away from the Illinois shore.

## Purchases and Mergers

**Further Consolidation Is Likely in Western New York—Foshay Merger Complete—Other Deals**

APPLICATION has been made to the New York Public Service Commission by the Buffalo, Niagara & Eastern Power Corporation for permission to acquire more than 10 per cent of the common stock of the Western New York Utilities Company, which owns and operates electrical plants in the counties of Erie, Genesee, Monroe, Niagara, Orleans and Wyoming, supplying electricity in the city of Batavia, the villages of Albion and Medina and other towns and villages in these counties. The Buffalo, Niagara & Eastern Power Corporation already owns a majority of the stock of the Niagara Falls Power Company, Niagara, Lockport & Ontario Power Company, Tonawanda Power Company and the Buffalo General Electric Company. The Western New York Utilities Company was incorporated in May, 1923, and authorized to issue 20,000 shares of preferred stock of a par value of $100 and 31,500 shares of common stock without par value. In the agreement $200 per share of stock is the sale price, and the Buffalo, Niagara & Eastern will pay the Western New York Utilities $5,500,000 in cash.

The W. B. Foshay Company has announced the completion of organization of the People's Light & Power Corporation, already noted, merging thirteen electric, gas, water and street-railway properties in Vermont, Wisconsin, Minnesota, Iowa, Arizona, Washington and Oregon. The electric subsidiaries grouped in the consolidation are the People's West Coast Hydro-Electric Corporation, formerly the West Coast Power Company, in Oregon; Willapa Power Company and Ilwaco Light & Power Company, in Washington; People's Arizona Gas & Electric Corporation, formerly the Globe Light & Power Company; People's Minnesota Gas & Electric Corporation; People's Wisconsin Hydro-Electric Corporation; Municipal Power Corporation, Wisconsin Hydro-Electric Company and the People's Hydro-Electric Vermont Corporation, formerly the Vergennes Electric Company.

The properties of the West Kentucky Electric Power Company at Sturgis and Earlington, Ky., have been taken over by the Kentucky Utilities Company (Insull-controlled), which is completing a 66,000-volt steel-tower transmission line from Paducah to Earlington.

The Illinois Northern Utilities Company has purchased the Marengo (Ill.) Public Service Company, serving the city of Marengo and the villages of Huntley and Union.

On Aug. 17 a special election was held in McLoud, Okla., on a proposal to grant the Oklahoma Gas & Electric Company an electric franchise and approve the sale of the electric distribution system owned by the city. The proposal carried, 102 for and 32 against.

The Virginia Electric & Power Company, which some time ago contracted with Elizabeth City, Edenton, Hertford and other places in northeastern North Carolina to furnish them with electricity, the municipal plants to be abandoned, has now made a similar contract with Scotland Neck. All these places will be tied in with the company's transmission system.

Frankenmuth, Mich., has voted by 94 to 2 to sell its municipal power plant to the Consumers Power Company. The Central Illinois Public Service Company has applied to the Illinois Commerce Commission for permission to take over the municipal electric plant at Middletown, Ill., where a recent election went 111 to 5 for the sale. Farmington, Mo., will shut down its municipal plant and will be supplied by an extension of the Union Electric Light & Power Company's line.

The City Council of Bardstown, Ky., has under consideration an offer from the Union Edison Company, Chicago, for purchase of the Bardstown power and light plant and water plant at a price of $135,000, the proposal carrying a scale of rates extending over a twenty-year franchise period. The Union Edison Company controls small steam and oil-engine plants scattered at Fairfield, Bloomfield, Taylorsville, Chaplin, Lebanon Junction and New Haven. It is reported that if the Bardstown plant is purchased, a large steam plant will be erected there, transmission lines will be built and Bardstown will become a central distributing point.

The Kentucky Utilities Company has offered $100,000 for the plant and franchise of the Harrodsburg (Ky.) municipal plant, promising the citizens lower rates than they now pay. The city commissioners have voted three to two to advertise the plant and twenty-year franchise for sale, and there may be a referendum vote on the company's offer.

The Southern Cities Power Company of Chattanooga has purchased the rights of the Lynchburg (Tenn.) Light & Power Company and the sale has been approved by the commission.

## New Method of Getting Fish Over Dams Tried

A successful experiment in raising fish over dams has recently been completed at the Winchester dam of the California-Oregon Power Company, on the Umpqua River, Ore. Use was made of a patented invention of J. R. Wheeler, construction man at Reedsport, Ore., for the West Coast Power Company, Portland. In this device an iron cylinder is placed upright in the river, extending from the river bottom to the top of the dam to be surmounted. The fish, swimming in the pools at the base of the dam, are trapped and induced to enter the cylinder through a gate near the bottom. At this period of the operation the level of the water in the cylinder is that of the stream below the dam. At suitable intervals this gate is closed and water is introduced into the cylinder from the top. Within the cylinder a screen, suspended horizontally from floats on the surface of the water, remains two or three feet below the surface and, rising with the water, keeps the fish swimming near the surface. When the cylinder is full a gate near the top opens and discharges a volume of water containing the fish into a flume leading to the reservoir above the dam. Operation of the gates is automatic and can be timed to suit the conditions of the run of fish to be lifted.

The experiment was financed by several Northwest power companies and the Oregon State Fish Commission and was completed with the personal assistance of Paul B. McKee, vice-president and general manager California-Oregon Power Company, Medford, Ore.; J. E. Yates, assistant chief engineer Pacific Power & Light Company, Portland, and the inventor.

## Hurley Prize Merchandising Contest Under Way

Electric light and power companies intending to compete for the three prizes of $5,000, $3,000 and $2,000, respectively, offered by Edward N. Hurley for demonstrations of successful merchandising should, if they have not already done so, notify J. E. Davidson, chairman of the Commercial National Section of the N.E.L.A., of their intention. All matter submitted for the competition must be at the N.E.L.A. headquarters in New York by Feb. 1, 1927. Thus the time in which to prepare and arrange data in a convincing manner will soon be growing short.

These generous prizes were first announced by Mr. Hurley, who is chairman of the executive committee of the Electric Household Utilities Corporation, at the 1925 convention of the association. They are the outcome of his desire "to stimulate improvement in the methods of distributing merchandise." The preparation of rules and conditions was left to the N.E.L.A. and intrusted by it to a committee headed by E. W. Lloyd. Qualifications and rules adopted were printed in full in the ELECTRICAL WORLD for Jan. 23, page 216. A folder containing them has been sent by the association to every executive of a member company, and widespread response is looked for.

## Mississippian Pleads Cause of Southern Water Power

Declaring that cheaper water power alone will make the South a prosperous industrial community, L. J. Folse, chairman of the Mississippi Board of Development, at a luncheon tendered 200 members of a "Know Mississippi Better" delegation at the Chamber of Commerce of the State of New York, made a plea last week to business men, bankers and heads of railroad companies to use their influence at Washington for the expedition of the legislation necessary to bring Muscle Shoals and the fifteen other water-power sites on the Tennessee River into full service.

"The Muscle Shoals plants," Mr. Folse said, "ought to be taken out of politics and put into immediate operation. More than 85 per cent of our people are farmers and suffering greatly from the one-crop idea, but we are anxious to become industrial centers. We have the raw materials, and the water power is available if you business men of New York will use your influence to move Congress to open up this great project."

# Briefer News

**Storm Lake, Iowa, Sticks to Private Service.**—Storm Lake, Iowa, voted on Aug. 25, at a special election, to renew the franchise of the Iowa Light, Heat & Power Company. Sixteen hundred votes were cast out of a total population of 4,000. The vote was 1,278 for the proposal and 322 against it. There had been considerable agitation for a municipal plant.

**Sac City Seeks to Oust Iowa Light, Heat & Power Company.**—Sac City, Iowa, in common with Schaller and Odebolt, has granted a franchise to the Sac County Electric Company, which owns a Diesel-engine generating station as well as the former municipal plant at Schaller. Sac City is seeking to force the Iowa Light, Heat & Power Company, by which it was formerly served, to vacate its streets and alleys, and the Mayor is to bring an action against that company, which, the city claims, should have removed its lines by Aug. 20.

**Original Mouth-of-Mine Plant to Be Supplemented by Larger One.** — The Canada Electric Company, Limited, which supplies the towns of Amherst and Springhill and adjacent portions of northeastern Nova Scotia with electricity, is building a new plant near Maccan, N. S. This company is a pioneer producer of power from the pit mouth, the original plant at Chignecto, N. S., being said to have been the first in America to generate electricity from coal mined alongside the generating station. The old plant, in the construction of which the encouragement of Thomas A. Edison was freely given, is now inadequate and a larger one at Maccan, contiguous to unlimited supplies of cheap fuel, is under construction. The present plant has a generating capacity of 2,700 hp. With a revival of Maritime Province prosperity it is expected that the increase will be rapidly absorbed.

**West Kootenay Company Starts Work on Station.**—The West Kootenay Power & Light Company, Rossland, British Columbia, has started preliminary work on a new station on the Kootenay River at the point where the falls enter the Slocan pool. The heavy construction will be done at low water, in January and February, when several hundred men will be employed.

**Louisville Company Buys Its Own Airplane as Permanent Equipment.**—The distinction of being the first utility company to own and operate its own airplane belongs, in the belief of Superintendent Addison W. Lee, to the Louisville Gas & Electric Company. Mr. Lee, who supervised an aërial surveying project in Louisville, cites four or five uses to which the airplane has been put and declares his conviction that it is as essential a piece of equipment as a transit or an automobile.

**Southern California Edison Pushing Work on Vincent Line.**—Work on the construction of the 220-kv. Vincent line is being pushed by the Southern California Edison Company, and the lower half of this line from the Magundsen substation, near Bakersfield, to the Laguna Bell substation, south of Los Angeles, is expected to be in operation early in 1927. The northern end of the line will be ready for use in 1928.

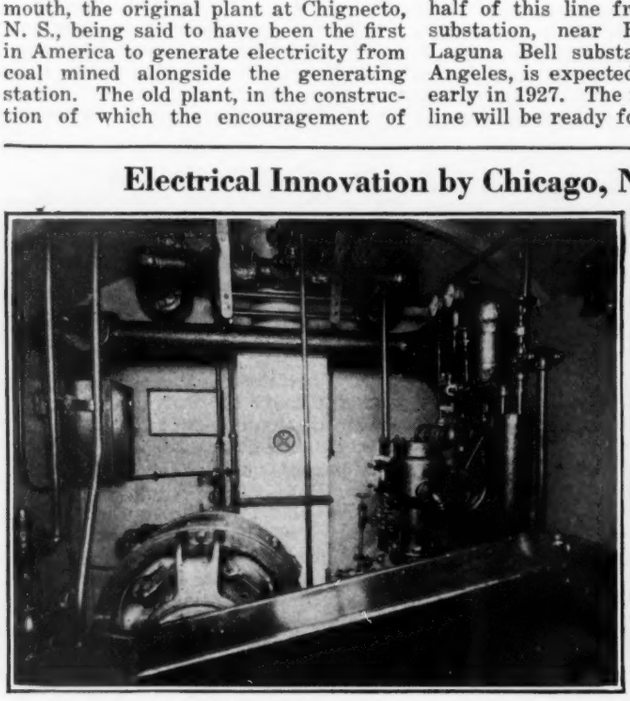
**Safety Rally in Kansas.**—The Kansas Public Utility Information Bureau has been asked by J. W. Greenleaf, of the Public Service Commission, to select ten executives of electric light and power companies of Kansas to represent the industry in a state-wide safety rally called by Gov. Ben S. Paulen for Sept. 9 and 10. Among the speakers scheduled to address the Kansas Safety Council are Herbert Hoover and Governor Samuel A. Baker of Missouri.

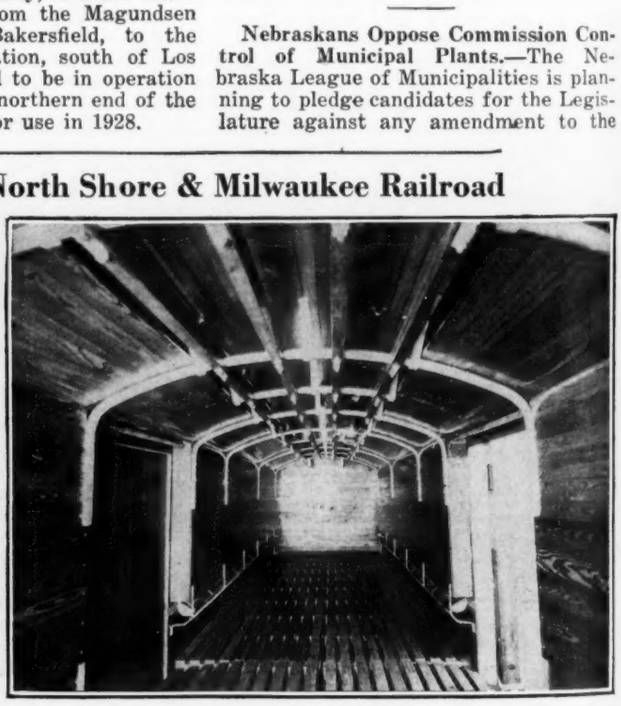
**Plans for Development of the Tuolumne.**—Application for permission to develop a 66,000-hp. hydro-electric project, the total cost of which will be more than $5,500,000, has been received by the California Division of Water Rights from the Yosemite Power Company, which asks for 175 cu.ft. a second and 65,000 acre-feet per annum from the south and middle forks of the Tuolumne River. The company plans to build three power houses.

**Big Discrepancy Between Commission and Company Valuations in Tennessee.**—The Tennessee Eastern Electric Company and the Johnson City Traction Company are seeking to have the courts set aside the valuation of $2,275,000 placed on their joint property by the Railroad and Public Utilities Commission of the state. The companies claim that their property employed in public service is worth $6,659,878 and that rates based on the commission's finding are confiscatory.

**Nebraskans Oppose Commission Control of Municipal Plants.**—The Nebraska League of Municipalities is planning to pledge candidates for the Legislature against any amendment to the

## Electrical Innovation by Chicago, North Shore & Milwaukee Railroad





ON MONDAY of this week an innovation in railroad service was inaugurated by the Chicago, North Shore & Milwaukee Railroad Company for use on its lines between Chicago, Waukegan, Racine, Kenosha and Milwaukee. This was the use of electric refrigerator cars for the preservation of perishables and cold-storage products in transit—the first regular service of this nature ever instituted by a railroad in the United States. The cars being used in this type of merchandise-dispatch service were especially built for the North Shore line. Each is equipped with an ammonia compressor, ammonia condenser and water-cooling apparatus, all of the refrigeration equipment being operated by electricity. Thermostatic control apparatus maintains uniform temperature, while the air-cooling method of refrigeration insures cleanliness and preservation of shipments in first-class condition during transit. Each of the five cars so far in use is equipped with control cabins at each end and is finished in the style of the regulation North Shore line passenger coaches, the absence of windows and passenger entrances being the one deviation in exterior appearance. The halftones show the interior of one of the cars and the machinery compartment.

present statutes that would permit the State Railway Commission to have control of the rates and service of the municipally owned plants. This has been attempted at past sessions, and the league officers profess to see in the taking over by the various power companies operating in Nebraska of so many of the smaller municipally owned plants a movement that would lead the power companies to back the commission control plan.

**Nevada Plants Tied In.**—A 60-kv. transmission line approximately 50 miles in length is now under construction between Virginia City, Nev., and the Lahonton plant of the Nevada Valleys Power Company. When this line is completed it will be utilized for the sale of energy by the Truckee River Power Company to the Nevada Valleys Power Company.

**Southern Cities Power Building New Plant.**—Work on a generating plant for the Southern Cities Power Company has started at Selmer, Tenn., where the company has purchased the local electric light plant and has secured a franchise. Selmer is the county seat of McNairy County, along the Mississippi-Tennessee state line. When completed the plant will be a distributing center for west Tennessee, the western office being at Selmer.

**Electrification of Maine Central Again Discussed.**—Rumors that the directors of the Maine Central Railroad may as the result of favorable engineering reports decide to embark on a comprehensive program of electrification have again started discussion of the project in the Portland press. The cost of the undertaking is put at $10,000,000, with large savings in fuel costs to ensue. Local interests look for a great impetus to the development of the state's hydro-electric power if the plan is carried out, particularly if the law forbidding exportation of energy is repealed and the state becomes part of the interconnected New England territory.

**Sparta and Jewell, Ga., Soon to Be Joined.**—Poles are now up on the new high-tension line being constructed by the Georgia Southern Power Company between Sparta and Jewell, and the work of stringing the wire will begin immediately. This line will connect with the Augusta-Aiken Railway & Electric Corporation's high-voltage line from Tallulah Falls and will give the section access to power from Muscle Shoals in case of an emergency through interconnection with the Georgia Railway & Power Company. The Augusta-Aiken company has the contract to serve the Jewell cotton mills at Jewell. Warrenton, Thomson and several other towns will also be served by the new power line.

**Illinois Power & Light Contemplates La Salle-Galesburg Line.**—The Illinois Power & Light Corporation is seeking right-of-way for a 66,000-volt transmission line to connect Galesburg and La Salle, Ill., and will apply to the Illinois Commerce Commission Sept. 8 for a certificate of convenience and necessity. The proposed line, approximately 75 miles in length, would bring about interconnection between the steam plant at La Salle and the water-power plant at Keokuk, Iowa, now connected with Galesburg.

**New Portland Electric Unit Economizes Both Space and Steam.**—Starting up a new 20,000-kw. Curtis steam turbo-generator at Station L early in August, the Portland (Ore.) Electric Power Company has brought its total generating capacity up to 181,272 hp. This company now operates the largest hog-fuel steam plant in the Northwest. The new unit is a General Electric 23,000-kva., 1,800-r.p.m., 11,000-volt machine and is designed to operate at a throttle pressure of 175 lb. and a temperature at 550 deg. F. At present it will operate at low pressure on surplus steam from the present boilers, but plans for expansion of Station L next year contemplate the installation of increased boiler capacity and a change in throttle pressure to 385 lb. The new machine occupies less space than a nearby old Corliss engine possessing one-tenth the capacity and using two and one-half times more steam per kilowatt-hour generated.

## Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

American Institute of Electrical Engineers — Pacific Coast convention, Hotel Utah, Salt Lake City, Sept. 6-9. F. L. Hutchinson, 33 West 39th St., New York.

Illuminating Engineering Society — Essex and Sussex Hotel, Spring Lake, N. J., Sept. 7-10. L. H. Graves, 31 West 46th St., New York.

Pennsylvania Electric Association — Bedford Springs, Pa., Sept. 8-10. H. A. Buch, 212 Locust St., Harrisburg.

Wisconsin Utilities Association, Commercial Section—Sherwood Forest Hotel, Green Lake, Wis., Sept. 9 and 10. J. N. Cadby, 445 Washington Bldg., Milwaukee.

Rocky Mountain Division, N. E. L. A.—Glenwood Springs, Col., Sept. 13-16. O. A. Weller, Public Service Co., Denver.

New England Division, N. E. L. A.—Poland Spring House, Poland, Me., Sept. 20-23. Miss O. A. Bursiel, 149 Tremont St., Boston.

International Association of Municipal Electricians — Battery Park Hotel, Asheville, N. C., Sept. 21-24. E. H. Benz, West New York, N. J.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 23-25. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

Wisconsin Chapter, Western Section International Association of Electrical Inspectors—Milwaukee, Sept. 27 and 28. Harvey Griem, City Hall, West Allis, Wis.

Association of Edison Illuminating Companies — Chateau Frontenac, Quebec, Sept. 27-Oct. 1. P. S. Millar, 80th St. and East End Ave., New York.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 1 and 2, A. Bliss McCrum, secretary.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 4 and 5. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Cleveland, Oct. 4-8. J. W. Welsh, 292 Madison Ave., New York.

American Electrochemical Society — Hotel Washington, Washington, Oct. 7-9. C. G. Fink, Columbia University, New York.

North Atlantic Section, American Society of Agricultural Engineers—State College, Pa., Oct. 11-13. R. T. Wagner, 1 River Road, Schenectady, N. Y.

Kansas Section, N. E. L. A.—Manhattan, Kan., Oct. 14-16. H. Lee Jones, 401 National Reserve Bldg., Topeka, Kan.

Electrical Supply Jobbers' Association — Atlantic City, Oct. 18-22. F. Overbagh, 411 South Clinton St., Chicago.

Electric Power Club—Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

**Harbor Point Station of Utica Company Starts Up.** — The new Harbor Point steam-electric plant of the Utica (N. Y.) Gas & Electric Corporation was put in operation on Aug. 31. The plant, which is situated on a peninsula in the Mohawk River, just north of Genesee Street, in Utica, has an initial rating of 30,000 kw., with 64,600 sq.ft. of boiler heating surface. Expansion to 150,000 kw. will be possible in the future, and the site is regarded as one of the most important in the Mohawk-Hudson system.

**Spokane Lumber Company Contemplates Six Hydro-Electric Plants.**—Giving promise of a water-power venture which will require the appropriation of approximately 200 sec.-ft. of water from streams and rivers in the vicinity of Spokane and cost $210,000, the Spokane Lumber Company has just filled six applications with the State Hydraulics Supervisor at Olympia, Wash. No estimate is made of the horsepower that will be generated, but it is stated that the electrical energy will also be sold to other interests, including mining and irrigation enterprises. Two reservoirs will be required, one at Sacheen Lake, where it will be fed by the Little Spokane River, and the other at Trout Lake. The company now owns and operates plants at the outlet of Horseshoe Lake and at Blake Lake, near by.

**Commonwealth Edison Serves Chicago's New Skyscraper.** — The new Jewelers' Building, the second highest in Chicago, draws its entire lighting and power supply from the Commonwealth Edison system. This building, which faces on Wacker Drive at Wabash Avenue, rises 40 stories to a height of 550 ft. Its connected load consists of about 1,000 hp. of power apparatus and 2,000 kw. of lighting. An elaborate floodlighting system will be installed to illuminate the exterior of the tower. It is expected that the maximum demand will be about 1,900 kw. at present and will increase to 2,500 kw. later. The building has a 23-story semi-automatic garage in the space usually devoted to a light court. This garage is served by four high-speed electric elevators. Cars are loaded on or unloaded from these elevators by tilting the floor of the elevator and stall platform. Storage platforms are moved in front of the elevators automatically when a key and check are withdrawn or replaced on a control board on the main floor, and doors are automatically opened and closed after the car enters or leaves the elevator.

# Men of the Industry

**N. A. Timmins**, president of the Hollinger Consolidated Gold Mines, has joined the board of directors of the Canada Northern Power Corporation. Mr. Timmins is deeply interested in the power situation in the mining districts. He is also a director of the Power Corporation of Canada, Ltd.

**Charles P. Cooper**, former president of the Ohio Bell Telephone Company, has been elected a vice-president of the American Telephone & Telegraph Company, in succession to Edgar S. Bloom, who resigned to become president of the Western Electric Company. Mr. Cooper, who is 42 years of age, is a native of Ohio and a graduate of the engineering department of the Ohio State University.

**Arthur T. Clark** has relinquished the post of superintendent of the Municipal Commission of Herkimer, N. Y., which carried with it responsibility for the city electric plant and other departments of the local government, and on Sept. 1 became connected with the South Bay Consolidated Water Company at Bay Shore, Long Island. Mr. Clark, who was graduated from the Rensselaer Polytechnic Institute of Troy, N. Y., in 1907, was appointed to take charge at Herkimer in 1918, after eleven years' experience as a hydraulic engineer.

**Ladner V. Ross** has been appointed illumination engineer with the Washington Water Power Company at Spokane. He was formerly with the Curtis Lighting, Inc., in Chicago.

**W. W. Spangler**, formerly assistant manager of the syndicate department of the Westinghouse Electric & Manufacturing Company, has been recently promoted to be supervisor of commercial research for the Westinghouse company. Mr. Spangler will assume his new duties immediately with headquarters in New York City.

**H. F. Farnham**, superintendent of construction of the Vermont Hydro-Electric Corporation and electrical superintendent of the affiliated Rutland (Vt.) Railway, Light & Power Company, has resigned to become superintendent of the Pennsylvania Edison Company at Easton, Pa.

**J. Frank O'Meara** of Worcester, N. Y., has been appointed assistant secretary to the Public Service Commission of the State of New York in place of Harold W. Palmer of Watertown, resigned.

**W. R. Schmidley**, who until recently filled the post of manager of the Wisconsin Power & Light Company's properties at Janesville, is now associated with Harrison A. Smith in the company's newly organized industrial development department, Madison.

**Frank J. Kiefer**, for the past three years field representative for the California Electrical Bureau, has resigned from that organization to accept the appointment of factory representative for the Armstrong Manufacturing Company, Huntington, W. Va., manufacturers of hardware and electrical specialties. Mr. Kiefer's headquarters will be in San Francisco. Prior to his association with the California Electrical Bureau Mr. Kiefer was connected with the Luthy Storage Battery Company in Hayward, Cal., for two years.

## Major Bennion Becomes N.E.L.A. Director of Engineering

Major Howard Sharp Bennion, former assistant chief engineer of the Federal Power Commission, has been appointed director of engineering at National Electric Light Association headquarters to succeed Colonel William Kelly, who leaves this office on Sept. 15. Colonel Kelly has resigned his work with the N.E.L.A. to become vice-president of the Buffalo, Niagara & Eastern Power Corporation, in charge of engineering and operation.

MAJOR H. S. BENNION

Major Bennion comes to the association with a distinguished record. He was born at Vernon, Utah, Sept. 7, 1889. He attended grammar and high school at that place and Salt Lake City, entering the United States Military Academy at West Point in March, 1908. He was graduated from the Military Academy in June, 1912, at the head of his class. He was also graduated at the head of his class from the Army Engineer School at Washington in April, 1915. Thereupon he was selected to specialize in electrical engineering at Cornell University, but declined this opportunity, because he feared it would lead to his becoming an instructor, and he preferred active service. This he had on the Texas border in 1915 and then in the Philippine Islands. In 1917 he was ordered from the Philippines to France in command of a battalion of engineers. Arrived in France, he was placed in charge of the newly constituted camouflage service. He held that job until after the armistice, attaining the temporary rank of lieutenant-colonel and receiving the distinguished service medal. After the armistice he became district engineer in charge of roads in the battle areas. For this work he was honored by France with membership in the Legion of Honor.

After Major Bennion's return from France at the end of 1919 he was placed in charge of the Division of Engineer Supplies in the office of the Director of Sales of the War Department. When the Federal Power Commission was organized in 1920 he was appointed assistant chief engineer, which position he held for four years. In September, 1924, he was appointed district engineer of the Fourth Mississippi River District at New Orleans, in charge of levee construction and bank protection works. He resigns from this work to join the staff of the N.E.L.A. Major Bennion has earned a reputation in the federal service for sound judgment, tact and real executive ability.

**F. H. Burke**, formerly manager of cedar-pole sales for the Weyerhauser Sales Company at Spokane, Wash., has been made manager for that company in the Chicago district and has been succeeded by **R. P. Bayne**, formerly cedar-pole service manager at Spokane.

**George E. Cullinan**, vice-president in charge of merchandising and sales of the Graybar Electric Company, has been presented with the gold and blue service medal of his company emblematic of 25 years' service with the Western Electric and Graybar Electric companies. A biographical sketch and portrait of Mr. Cullinan were printed on Jan. 8 last under "Men of the Industry."

**Thorne A. Browne**, chairman of the Nebraska State Railway Commission, who was defeated for renomination in the recent state republican primary by John H. Miller, has since resigned to become industrial commissioner for the Omaha Chamber of Commerce. Mr. Browne handled nearly all of the electric company applications, which in Nebraska are restricted merely to requests for authority to issue stocks and bonds, and won high commendation from leaders in the industry for his fairness and his grasp of their problems.

**Frank P. Withers**, formerly service engineer for the Line Material Company of South Milwaukee, Wis., has become associated with the Illinois Electric Porcelain Company of Macomb, Ill., in the capacity of electrical engineer and in charge of the Chicago district office. Mr. Withers was born in Bristol, England, removing to Chicago in 1895. He received his education at Mount Carmel Academy, St. Vincent's College, De Paul University and Lewis Institute of Technology, all in Chicago. He entered the service of the Commonwealth Edison Company in 1903 and divided fifteen years of service between the meter, street and engineering departments, specializing on distribution and transmission construction. From 1917 to 1919 he was with the G. & W. Electric Specialty Company as sales engineer. In the year last named he assumed the duties of manager of the engineering department of the Central Electric Company and remained with that firm until 1924, when he joined the Line Material Company as service engineer. While there his time was devoted entirely to distribution and transmission-line crews, making suggestions and exchanging ideas on matters pertain-

ing to this class of work, including organization and safety methods. He also has made an interesting study of actual time required for almost every labor operation involved in line construction, this survey taking him to almost every state east of the Rocky Mountains and requiring two years to complete. Mr. Withers is a member of the American Institute of Electrical Engineers and other societies.

**William G. Keay,** for several years New England manager of the Eureka Vacuum Cleaner Company, Boston, has resigned and become district sales representative of the Smith Home Appliance Company, with headquarters at Watertown, Mass.

**J. J. Cooper,** for 22 years associated with the Mountain Electric Company, Denver, has bought out the other interests and is now president. For the last six years Mr. Cooper has been managing head of the company.

**Gano R. Baker,** formerly affiliated with the industrial division of the San Francisco office of the Westinghouse Electric & Manufacturing Company, has resigned to become sales engineer for the Spencer Elevator Company in that city.

**G. R. Davidson,** for six years connected with the publicity department of the British Columbia Electric Railway Company, Ltd., Vancouver, recently resigned to enter the financial field. He has been succeeded by **Walter S. Hudson.**

**L. A. Cowles** of Vermilion, S. D., chief engineer of the University of South Dakota and consulting engineer of the Vermilion municipal electric plant, has been chosen by the Rochester (Minn.) Public Utilities Board to succeed C. C. Hadley as superintendent of the Rochester municipal plant. Mr. Hadley recently resigned.

**Eugene Logan,** for the past nineteen years connected with the Washington Water Power Company, Spokane, has resigned to engage in the general practice of civil engineering in that city. Mr. Logan had been identified with the company's engineering projects, including location of transmission lines and the preliminary surveys and reports on the Kettle Falls and Chelan projects.

**L. M. Shadgett,** formerly engineer in the distribution department of the Alabama Power Company, Birmingham, has been transferred to the Northern Division headquarters at Huntsville, Ala., where he will become division superintendent. Before Mr. Shadgett became connected with the Alabama Power Company in 1924 he was with the Adelaide Electric Supply Company, Ltd., which supplies power to the State of South Australia.

**J. A. McWilliams** has been appointed field representative for the California Electric Bureau to succeed Frank J. Kiefer, resigned. For twelve years Mr. McWilliams was connected with the Washington Water Power Company, Spokane, and for five years of that time was one of the company's district managers. In 1922 he resigned from that position to go to California, locating in Fresno. He joined the Valley Electrical Supply Company as range specialist, later being made manager of range sales and then sales manager. Mr. McWilliams left the electrical industry to join the staff of the Metropolitan Life Insurance Company in San Francisco, his new appointment marking his return.

**Prof W. L. De Baufre,** head of the department of mechanical engineering at the University of Nebraska, has received a year's leave of absence in order that he may undertake research work in electric power development for the International Combustion Engineering Corporation of New York. He will take with him several assistants who have been working with him and will begin his new work early in September.

## H. J. Cook New President of Trumbull-Vanderpoel Company

Harmon J. Cook, who has been elected president and general manager of the Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., as announced in the Aug. 14 issue of the ELECTRICAL WORLD, is a graduate of the Sheffield Scientific School of Yale University and has been engaged in manufacturing for the past fifteen years. For twelve of these years he was associated with the Torrington Company and its affiliated companies. For five years prior to 1923, when he became identified with the Trumbull-Vanderpoel Electric Manufacturing Company, he was works manager for the Progressive Manufacturing Company, the standard plant of the Torrington Company as well as other of its subsidiaries.

H. J. COOK

**Earl V. Moore,** who has been identified with the Wisconsin Power & Light Company's properties at Portage, has been promoted to manager of the company's properties at Wyocena.

**C. L. Passmore** has resigned his post as general manager of the Iola Light & Power Company, recently acquired by the Wisconsin Power & Light Company, to enter the oil business.

**Walter F. Helmreich,** for many years chief mechanical and electrical engineer with the Missouri Public Service Commission, has resigned to become manager of the Capital City Water Company, Jefferson City. Mr. Helmreich was born in Cooper County, Mo. He was graduated from the Missouri State University with a master's degree in mechanical and electrical engineering, taught in the David Rankin Jr. School of Mechanical Trades, St. Louis, for six years and was assistant mechanical and electrical engineer to the Arkansas Public Service Commission for one year prior to his connection with Missouri Public Service Commission.

**R. M. Harding,** local manager of the Columbus (Ga.) Electric & Power Company and well known among electrical men in the state, is back at his desk after an illness of nearly a year.

**Harold M. Graham** has joined the Ross Heater & Manufacturing Company, Inc., of Buffalo, as chief engineer. Mr. Graham is well known in the industry, having had a very broad and comprehensive experience in power-plant engineering in both the developing and the designing of equipment. Entering the employ of the Westinghouse Electric & Manufacturing Company in 1915, he was active in the condenser department of that company until 1917. In 1919 he became associated with the Elliott Company, where he remained up to this time. Mr. Graham has done a great deal of original work and investigation on the subject of heat transmission and vacuum which has placed him among the leaders in that special line of endeavor.

**Ross H. Rathbun** has joined the Ross Heater & Manufacturing Company, Inc., of Buffalo, as sales manager. Mr. Rathbun leaves the Westinghouse Electric & Manufacturing Company, with which he had been associated since 1916. In that year he returned to the United States from Mexico, where a number of years were spent as chief engineer for the Madera Company, Ltd. In the central-station industry Mr. Rathbun has a wide acquaintance, having been in charge of the central-station department of the Westinghouse Electric & Manufacturing Company, with headquarters at Cleveland.

# Obituary

**Reuben W. Le Baron,** electrical contractor and engineer, died at his home in Arlington, Mass., on Aug. 29. Mr. Le Baron was for twenty-one years superintendent of wires and fire alarms in Arlington and was widely known as an inventor. He devised many improvements in fire-alarm systems and was active in electrical contracting circles.

**W. P. Strickland,** who was connected with the New York & Queens Electric Light & Power Company for many years, died at his home in Elmhurst, Long Island, Aug. 14. Mr. Strickland was one of the pioneers in safety and welfare work in the public utility field, and until the last few weeks he was actively engaged in accident prevention work. He was a member of the American Museum of Safety, the American Society of Safety Engineers and the National Safety Council, contributing from time to time articles which were published by the official organs of these societies. He served on various subcommittees, where his wide experience and knowledge helped to formulate many of the rules which are now standard practice in the public utility field.

# Recent Court Decisions

**Rate Discriminations Cannot Be Based on Size of Population Served.**—In Pabst Corporation vs. City of Milwaukee, a case affecting the rates of the Milwaukee municipal waterworks, the Supreme Court of Wisconsin said: "There is no real or substantial difference between the water plant of Milwaukee and the waterworks owned by other cities in Wisconsin which could be made the basis of a classification which would exempt Milwaukee from the regulation of its water rates by the Railroad Commission while every other municipal water plant of the state is subject to such regulation. It cannot be said with reason that the fact that a larger number of people live in cities of the first class makes the establishment of water rates in cities of that class such a different problem from the making of rates in other cities as to furnish a reasonable basis for a classification that is germane to the purposes of the law regulating utility rates. The fact that a larger number of people are affected by the water rates in Milwaukee than in any other city of the state in no way presents a different economic social or political condition or in any way distinguishes Milwaukee from the other cities of the state in any respect germane to the making of just and reasonable water rates. Any attempt to classify cities according to population with reference to the making of rates must fail because it is not based on characteristics legitimately distinguishing the members of one class from those of another with respect to the public purposes sought to be accomplished in the establishment and regulation of rates." (208 N.W. 493.)*

**Commission Order to Reconstruct Transmission Lines on Private Right-of-Way Paralleling Railroad Overruled.** — The Iowa Electric Company constructed on a private right-of-way transmission lines paralleling for about 2,000 ft. the telegraph and telephone lines of the Chicago, Rock Island & Pacific Railway Company and the telegraph wires of the Western Union Telegraph Company. The Iowa Railroad Commission, upon complaint of the railway company, held that it had jurisdiction as to the manner of construction of transmission lines on public as well as private lands and ordered the electric company to remove alleged inductive-interference and physical hazards within 120 days. On appeal by the electric company the District Court held that under the law the commission has jurisdiction to determine whether or not a transmission line on a private right-of-way was erected, operated and maintained in the manner provided by law, but that the courts had the power to overrule unreasonable decisions. Holding the decision under review to be of that nature, the court said: "It does not appear that there is any good reason why the railway company, when it reconstructs its lines, may not place them on the north side of its right-of-way without any additional expense to the railway company other than raising the lines where they cross over its track, and that expense the defendant board could have required the plaintiff company to pay. The expense would have been infinitesimal as compared with the expense and inconvenience burdened on the plaintiff company by the order that was made. It is shown quite conclusively that before a breakdown or fall of the transmission line could occur by reason of a storm, or weight from ice and snow, so as to cause a hazard to the property or employees of the railroad company, the telegraph and telephone lines as they are now would be entirely destroyed. And while these lines have been in operation for about two and a half years there is no evidence, or even complaint, that there has ever been any inductive interference with either the telegraph or telephone lines; but it is shown by test made the day before this case was heard that there was no inductive interference at that time. It was also shown without contradiction that the transmission line is constructed in all respects as required by the statute and by the rules adopted by this defendant board, except the distance of separation horizontally."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Commission Rulings

**Purchase of Paper Company's Dams and Water Rights by Hydro-Electric Company Approved.** — Approving the purchase by the Oneida Power Company of dams and water rights belonging to a paper company, the Wisconsin Railroad Commission said that such transactions serve public convenience and necessity where it appears that the utility business is a perpetual and growing one in which the public is directly concerned, while the continuance of the paper business is dependent upon the supply of raw material; where the operation by the utility will result in a cheaper production of power and lower rates, where the utility is strategically situated so that eventually it may tie in with other systems, and where it is desirable that the paper company be confined to private business.

**Commission Not Concerned if Purchaser Pays More than Value for Municipal Plant.**—Explaining why it might approve an agreement for the sale of a municipal plant at a price in excess of the value, under a statute indicating that the function of the commission is to protect the municipality from obtaining an inadequate compensation, the Wisconsin Railroad Commission said: "The statute provides merely that if the compensation fixed by the commission shall be larger, then the same shall be the compensation paid for the utility. The statute is silent as to what the effect of fixing a smaller compensation by the commission would be, but the inference is that in such an event the agreed compensation would control and, therefore, the fixing of a smaller compensation than agreed upon would have no effect. Such being the situation, the only concern of the commission is that the compensation to be paid for the property is at least adequate therefor. If the private company desires to purchase or is willing to purchase at a higher figure than represents the fair value of the property, that is its own concern. Of course, in approving such a purchase the commission does not in any way preclude itself from arriving at a lesser valuation than that agreed upon and using such lesser valuation for the purpose of making rates or for the purpose of fixing a fair compensation in case of subsequent acquisition by the municpality."

**Territory Not to Be Kept Sacred Awaiting Claimant's Convenience.**—"A public service corporation has no right to assume that territory in which it might operate will be kept sacred and inviolate until such time as it shall decide that it is ready to enter. In such cases the needs of the people are paramount. This has been the policy of the commission." This ruling was made by the New York Public Service Commission recently when it granted to the Nassau & Suffolk Lighting Company the right to distribute electricty in a part of the town of Hempstead known as Island Park and including that part of the town known locally as Barnum's Island. This ruling was over objections by the Queens Borough Gas & Electric Company and the Long Island Lighting Company, which opposed the right of the Nassau & Suffolk company to serve customers. Finding valid a disputed franchise acquired by the Nassau & Suffolk company through the merger with it of the Nassau Illuminating & Power Company, the commission said: "If the determination of the commission were to be based solely upon duplication of plant, it seems very clear that the petition of the Nassau & Suffolk company should be granted, otherwise a much greater duplication of existing facilities will be necessary. While this community has developed until at the present time there are approximately 500 houses besides business places and hotels, no move was made by the Queens Borough company to enter the field until after the filing of the petition in this proceeding. Only then did the Queens Borough company act. This Queens Borough line is entirely inadequate, and we cannot escape the conclusion that it was merely to enable the company quickly to get into that territory. As a matter of fact, the Queens Borough company neglected to enter this field and furnish service until twelve days after the petition had been filed in this proceeding, when within a period of 24 hours it constructed a line 2½ miles in length without the reimbursement requirement which it had demanded when the Island Park-Long Beach Company had requested it to furnish service three years before. Since the delay of the petitioner in making application for approval was not willful, there is no reason why the plant or consumers should be punished by being for a time at least deprived of service."

# Financial and Corporate

## Seasonal Dullness Evident

**Moderate Fluctuations in Electric Securities Leave the Closing Levels Much as Previously**

TRANSACTIONS in power and light securities in the last week differed somewhat from the more recent periods in that business lost much of its vigor. Advances and recessions from day to day left prices at about the closing levels of the week before. Trading in the general list was marked by a dull and irregular trend.

With the exception of several favorable earnings reports coming from prominent holding concerns, little in the way of developments of significant character occurred to warrant a definite trend in market values, with the result that prices dilly-dallied in an aimless manner.

The report of the American Power & Light Company and subsidiaries for the year to June 30 showed net income after depreciation and interest of $9,290,051 —equivalent, after preferred dividends, to $4.70 on 1,681,538 shares of no-par common stock—against $6,876,945, or $3.51 on 1,608,637 shares outstanding, in the previous period. Louisville Gas & Electric and Northern States Power reported equally satisfactory earnings for the twelve months ended July 31.

In the counter group American Public Utility shares registered the greatest gains, the participating preferred adding four points to previous levels and prior preferred one point. Rochester Gas & Electric preferred B moved forward three points on very small buying orders.

Kindred shares listed on the New York Stock Exchange and curb market displayed considerable irregularity. American Gas & Electric and United Gas Improvement occupied the foreground from a standpoint of advances, with respective gains of one and one-half and two points. American Light & Traction and Electric Bond & Share lost ground to the extent of three and one-half and two and one-half points respectively.

## American Power & Light Company's Good Year

The American Power & Light Company, whose operations are supervised by the Electric Bond & Share Company, has issued a report for the twelve months ended June 30, 1926. The earnings applicable to common stock outstanding at the end of the period amounted to $4.70 per share for the twelve months ended June 30, 1926, as compared with $3.51 per share for the twelve months ended June 30, 1925. Earnings on the average amount of common stock outstanding during these periods amounted to $4.82 per share for the twelve months ended June 30, 1926, as compared with $3.66 for the twelve months ended June 30, 1925.

Gross earnings of subsidiaries for the twelve months ended June 30, 1926, amounted to $56,029,311, an increase of 23 per cent over the preceding twelve months. Net earnings for the twelve months ended June 30, 1926, amounted to $24,806,096, an increase of 23 per cent over the previous twelve months. Of the total gross earnings of subsidiaries for the last twelve months, 75 per cent was derived from electric power and light service, 15 per cent from gas service and 10 per cent from miscellaneous service.

The balance sheet of the American Power & Light Company at June 30, 1926, shows total assets of $94,623,558. Current assets were $26,458,991 and current liabilities amount to $1,503,557. The surplus of the company amounted to $4,155,644. The company's only funded debt consists of $45,912,400 debenture bonds, which are not due until 2016.

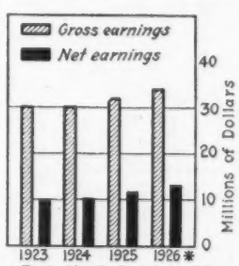
Subsidiaries of the American Power & Light Company serve a total of 599 communities in Arizona, Florida, Idaho, Iowa, Kansas, Minnesota, Nebraska, Oregon, Texas, Washington and Wisconsin. The total population served is estimated to exceed 2,749,000. Approximately 687,300 consumers are served, of whom 486,500 are supplied with electric power and light service. For the twelve months ended June 30, 1926, electric output amounted to 1,801,454,800 kw.-hr. The properties owned by the operating subsidiaries include electric generating stations having a total installed generating capacity of 515,155 kw., with 88,300 kw. additional capacity under construction; 6,111 miles of high-voltage transmission lines and 8,338 miles of electric distribution system.

## North American Light & Power Company

**Clement Studebaker Utility Now Does an Annual Gross Business of About $34,000,000—Has a Simplified Capital Structure**

BY PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

THE North American Light & Power Company, which is known as the prominent Clement Studebaker property, controls the entire common stock of the Illinois Power & Light Corporation, which in turn gives it control over such subsidiaries as the Kansas Power & Light Company, the Iowa Power & Light Company and the Missouri Power & Light Company. These serve a population of more than 1,350,000 in 520 different communities in Illinois, Iowa, Kansas and Nebraska.




SUBSTANTIAL GROWTH IN EARNINGS OF NORTH AMERICAN LIGHT & POWER

Through its bankers the North American Light & Power Company recently offered an issue of 30-year sinking-fund debenture 5½ per cent bonds at 94½, to the amount of $15,000,000, to yield 5.90 per cent to maturity. Upon completion of the new financing the company will have a capital structure distinguished for its simplicity. Only three types of security will be outstanding, one issue of bonds and two of stock. There will be, in other words, the fifteen-million-dollar issue of 5½ per cent debenture bonds, 85,000 shares of cumulative preferred stock entitled to six-dollar dividends and 600,000 shares of common stock.

Growth of the properties in the system has been substantial in recent years, and the consolidated earnings statement for the twelve months ended April 30, 1926, showed gross revenues for the properties of $33,738,742. That the management has been able to turn a reasonable proportion of this into margins of safety for the security holders is shown by the distribution of the total for the period mentioned. Operating expenses, maintenance and taxes consumed $20,805,009 of the total, leaving $12,933,733 as net earnings after depreciation. Deductions on account of such items as subsidiary company interest and amortization charges, subsidiary preferred dividend requirements and depreciation and sinking-fund reserves consumed $9,956,403 of the net earnings, leaving a balance of $2,977,330 available for the bond interest and dividend requirements of the parent, the North American Light & Power Company. Since the annual interest charges on the new fifteen-million-dollar issue of debentures will aggregate only $825,000, the indicated balance of $2,977,330 is, as will be seen, more than three and six-tenths times the annual interest requirements of the company upon completion of the present financing.

In explanation of the purpose of the new financing Clement Studebaker said: "A portion of the debentures may be issued to former shareholders of the North American Light & Power Com-

pany (Maine) in connection with the reorganization, in which case the company will receive cash on account of common stock equal to the cash it would have received had such debentures been sold by the company. The proceeds of the debentures sold by the company (and cash received for any common stock so issued) will be used to retire the entire issue of the notes of this company known as North American Light & Power Corporation 7 per cent secured notes and the preferred stock of the North American Light & Power Company (Maine), to furnish additional working capital, and for other purposes in connection with the reorganization of the company."

## North American Light & Power Reorganization

Reorganization of the North American Light & Power Company, announced last June as under way, has been completed and become effective. In this reorganization the Middle West Utilities Company and the North American Company acquire a majority of the common stock of the North American Light & Power Company. Clement Studebaker, Jr., continues as president and in the active direction of the company and with his associates retains a substantial interest in the common stock. The establishment thus effected of a community of interest among three of the largest and most important public utility groups in the Middle West will, it is believed, result in greater operating efficiency for all three concerns and an improved service covering a large section of the Mississippi River Valley.

Coincident with the reorganization of the North American Light & Power Company comes that of the Illinois Power & Light Corporation, an important subsidiary. This reorganization was announced last June but is just now completed and made effective. W. A. Baehr, vice-president and general manager, has retired and is succeeded by L. E. Fischer, who has long been associated with the corporation and its predecessors and who, as reported under "Men of the Industry" last week, has just been made vice-president also of the parent company. Scott Brown has retired as secretary of the Illinois Power & Light and is succeeded by Dwight Holmes, and P. C. Dings has retired as treasurer and is succeeded by P. L. Smith. Clement Studebaker, Jr., continues as president, and no changes of personnel in the operating staff or management of local properties are contemplated by the corporation or by any of its numerous subsidiary and allied operating companies.

## More Legal Utility Bonds for Massachusetts Banks

A supplementary list of public utility bonds declared legal for investment by savings banks in Massachusetts under the law passed by the last Legislature of that state was issued this week, as follows:

Dayton Power & Light Company: Dayton Lighting Company first and refunding mortgage 5's, 1937.

New York Edison Company: New York Gas & Electric Light, Heat & Power Company first mortgage 5's, 1948; New York Gas & Electric Light, Heat & Power Company purchase money mortgage 4's, 1959.

Rochester Gas & Electric Corporation: Canandaigua Electric Light & Railroad Company first mortgage 3½'s, 1927; Canandaigua Electric Light & Railroad Company first mortgage 6's, 1927; Municipal Gas & Electric Company first mortgage 4½'s, 1942; Rochester Railway & Light Company Consolidated mortgage 5's, 1954.

Southern California Edison Company: Mentone Power Company first mortgage 5's, 1931; Mount Whitney Power & Elec-

## Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Tuesday Aug. 31 | Low 1926 | High 1926 |
|---|---|---|---|
| **ABITIBI PWR. & PAPER, com.** | | | |
| —no par | 91½ | 70½ | 91½ |
| Adirondack Pwr. & Lt.—7% pf. | 108 | .... | .... |
| Adirondack Pwr. & Lt.—8% pf. | 113 | .... | .... |
| Ala. Pwr., pf. | 105 | .... | .... |
| Allis-Chalmers Mfg. pf. | k109½ | 105 | 110½ |
| Allis-Chalmers Mfg., com. | k 89 | 78½ | 94½ |
| Aluminum Co. of Amer., com. | 69½ | 54½ | 76 |
| Aluminum Co. of Amer. new, pf. | 101 | .... | .... |
| Amer. & Foreign Pwr., pf. 25% pd. | m110 | .... | .... |
| Amer. & Foreign Pwr., 7% pf.—no par | k 90 | 88½ | 98 |
| Amer. & Foreign Pwr., com.—no par | k 19½ | 15½ | 42½ |
| Amer. Bosch Magneto, com—no par | 20½ | 16 | 34½ |
| Amer. Brown, Boveri, Elec. | k 46½ | 30½ | 50 |
| Amer. Brown, Boveri, Elec., pf. | k 96½ | 86½ | 97½ |
| Amer. Elec. pwr., pf. | m111 | 102 | 111 |
| Amer. Gas & Elec., 6% pf.—no par. | 94½ | .... | .... |
| Amer. Gas & Elec., com.—no par... | 97½ | 64 | 99½ |
| Amer. Lt. & Trac., 6% pf. | 107 | 105 | 115½ |
| Amer. Lt. & Trac., com. | 223 | 195 | 263 |
| Amer. Pwr. & Lt., 6% pf. | 98 | .... | .... |
| Amer. Pwr. & Lt., com.—no par... | k 66½ | 50½ | 72 |
| Amer. Pub. Serv., 7% pf. | a 97 | 92 | 99 |
| Amer. Pub. Serv., com. | .... | 45 | 80 |
| Amer. Pub. Utilities, 6% pf. | 86 | .... | .... |
| Amer. Pub. Utilities, 7% pf. | 97 | .... | .... |
| Amer. Pub. Utilities, com. | 77 | .... | .... |
| Amer. States Sec., A. | 3 | .... | .... |
| Amer. States Sec. B. | 2½ | .... | .... |
| Amer. Superpwr., pf.—25 | m25½ | 23 | 26½ |
| Amer. Superpower, pf. | l 92½ | .... | .... |
| Amer. Superpwr., Class A—no par. | k 30½ | 19½ | 37½ |
| Amer. Superpwr., Class B—no par. | 30 | 21½ | 39 |
| Amer. Wtr. Wks. & Elec., 7% pf. | k106 | 101½ | 108½ |
| Amer. Wtr. Wks. & Elec., com.—20. | 58½ | 43½ | 74 |
| Anaconda Copper | 50 | 41½ | 51½ |
| Appalachian Pwr., 7% pf. | 98 | 98 | 101 |
| Appalachian Pwr., 1st pf., 7% | 98 | 98 | 101 |
| Appalachian Pwr., com. | 78 | 77 | 83 |
| Arizona Pwr., 7% pf. | 64 | .... | .... |
| Arkansas Cent. Pwr., pf., $7—no par | 104 | 99 | 107 |
| Arkansas Lt. & Pwr., 7% pf. | 101½ | .... | .... |
| Arkansas Lt. & Pwr., com. | 100½ | .... | .... |
| Asheville Pwr. & Lt., 7% pf. | l107 | 100½ | 107½ |
| Assoc. G. & E., pf.—$3.50—50 | 50 | .... | .... |
| Assoc. Gas & Elec., pf.—$6—no par | 84 | .... | .... |
| Assoc. Gas & Elec., Class A—no par | 37½ | 25½ | 38½ |
| **BABCOCK & WILCOX, com.** | 118 | 117 | 151 |
| Binghamton Lt., Ht. & Pwr., pf. | 105 | 105 | 110 |
| Birmingham Elec. pf.—$7—no par... | 103½ | .... | .... |
| Blackstone Valley Gas & Elec., pf. | 103 | 103 | 105 |
| Blackstone Valley G.&E., com.—50. | m98 | .... | .... |
| Blaw-Knox, com. | t 65½ | 45 | 65½ |
| Brazilian Trac., Lt. & Pwr., com. | f116½ | .... | .... |
| Broad River Pwr., pf. | 95 | .... | .... |
| Brooklyn Edison, com. | 151 | 133 | 159 |
| Buffalo, Niagara & East. Pwr., pf.—25. | l 24½ | .... | .... |
| Buffalo, Niagara & Eastern Pwr., com.—no par | l 31 | .... | .... |
| **CALIFORNIA ELEC. GENERATING, pf.** | 94 | 92 | 97 |
| California Ry. & Pwr., pf. | 90 | 88 | 115 |
| Carolina Pwr. & Lt., pf.—$7—no par | 107 | .... | .... |
| Cent. & S. W. Ut. 7% pf.—no par | a 93 | 89½ | 96½ |
| Cent. & S. W. Ut., pr. ln. pf.—no par | a 98 | 93 | 100 |
| Central Ariz. Lt. & Pwr., pf. | 102 | .... | .... |
| Central Ark. Ry. & Lt., 7% pf. | 100 | .... | .... |
| Central Ill. Pub. Serv., 6% pf. | a 88½ | 87 | 91 |
| Central Ind. Pwr., 7% pf. | 87 | 84 | 93 |
| Central Pwr. & Lt., pf. | 98 | .... | .... |
| Central States Elec., 7% pf. | 91 | .... | .... |
| Central States Elec., com. | m200 | 200 | 230 |
| Century Elec., com. | m115 | 110 | 116 |
| Chicago Fuse Mfg., com., no par... | m30½ | 30 | 35 |
| Cincinnati Gas & Elec., com. | g 90½ | 88 | 95 |
| Cities Service, 6% pf. | l 89½ | 86½ | 89½ |
| Cities Service, pf. B—10. | l 7½ | 7¼ | 7½ |
| Cities Service, pf. BB—100. | l 77½ | 74 | 79 |
| Cities Service, com.—20. | l 44½ | 37½ | 44½ |
| Cities Service, Bks. Shrs.—10. | l 22½ | 19½ | 22½ |
| Clarion River Pwr., pf. | 93 | 93 | 95 |
| Cleveland Elec. Illg., 6% pf. | 106 | .... | .... |
| Cleveland Elec. Illg., com. | 285 | .... | .... |
| Coloradо Pwr., 7% pf. | 95 | 96 | 97 |
| Columbia Gas & Elec., 7% pf. | 96½ | 92 | 98 |
| Columbia Gas & E., com.—no par. | 81½ | 78 | 85 |
| Columbia Ry., Gas & Elec., 6% pf. | 99 | 97 | 100 |
| Columbus Elec. & Pwr., 2d pf. | 104 | .... | .... |
| Columbus Elec. & Pwr., com. | 255 | .... | .... |
| Columbus Ry., Pwr. & Lt., 1st pf. | 98½ | 98 | 99½ |
| Columbus Ry., Pwr. & Lt., pf. B. | 93 | 92 | 97 |
| Col. Ry., Pwr. & Lt., com.—no par. | 80 | .... | .... |
| Commonwealth Edison, com. | a134½ | 135½ | 145 |
| Commonwealth Pwr., 6% pf. | 87 | 82 | 87½ |
| Commonwealth Pwr., com—no par.. | 40½ | 28½ | 42½ |
| Conn. Lt. & Pwr., 8% pf. | 116 | 117 | 121 |
| Conn. Lt. & Pwr., 7% pf. | 108 | .... | .... |
| Cons. Gas of N. Y., pf.—50. | 59½ | .... | .... |
| Cons. Gas of N.Y., com.—no par | 106 | 87 | 115½ |
| Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf. | m107 | 102 | 107½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf. | e111 | 108½ | 111½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf. | e113½ | 109 | 113½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf. | e127½ | 124 | 128½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par | e 53½ | 45 | 57½ |
| Cons. Pwr. & Lt., 7% pf. | 105 | .... | .... |
| Consumers Pwr., 6% pf. | 97½ | .... | .... |
| Consumers Pwr., 6.6% pf. | 103½ | .... | .... |
| Continental Gas & Elec., 7% pfc. pf | 101 | .... | .... |
| Continental Gas & Elec., 7% pr. pf. | 96½ | .... | .... |
| Continental G.&E., com.—no par... | 140 | 85 | 150 |
| Crocker Wheeler, com. | 18 | 14 | 21 |
| Crocker Wheeler, pf. | 53 | 50 | 55 |
| **DALLAS PWR. & LT., 7% pf.** | 105½ | .... | .... |
| Dayton Pwr. & Lt., 6% pf. | 105 | .... | .... |
| Detroit Edison, com. | 136 | 123½ | 141½ |
| Dubilier Condenser & Rado, com.—no par | 6 | 4½ | 11 |
| Dubuque Elec., 6% pf. | 94 | 94 | 98½ |
| Duquesne Lt., 7% pf. | k115 | 111½ | 116½ |
| **EAST. N. Y. UTIL. pf.** | 104 | 85 | 105 |
| Eastern New York Utli., com. | 65 | 60 | 70 |
| Eastern States Power. | 15 | .... | .... |
| Eastern States Power, pf. | 88 | .... | .... |
| Eastern Tex. Elec., 7% pf. | 104 | .... | .... |
| East. Tex. Elec., com.—no par. | 75 | 70 | 80 |
| Edison Elec. Illum. of Boston, com. | d229½ | 207 | 250 |
| E. Paso Elec., com.—no par | 70 | 70 | 94 |
| E. Paso Elec. pf. | 104½ | .... | .... |
| Elec. Bond & Share, 6% pf. | k107½ | 103½ | 109½ |
| E. Bd. & Share Sec., com.—no par.. | k 70½ | 56½ | 86 |
| El. Household Util. | a 14½ | 13½ | 25 |
| Elec. Investors, 6% pf.—no par. | 92½ | .... | .... |
| Elec. Investors, com.—no par. | 43 | 30½ | 74½ |
| Elec. Investors, 10% pd. receipts | 20 | 12 | 56 |
| Elec. Pwr. & Lt., ctfs. pf. | 96½ | 100 | 89½ |
| Elec. Pwr. & Lt., ctfs., 40% pd. | k104½ | 99½ | 115 |
| Elec. Pwr. & Lt., ctfs. full pd. | k104 | 103 | 110½ |
| Elec. Pwr. & Lt., ctfs., com—no par. | 18½ | 15½ | 34½ |
| Elec. Refrig. | 63½ | 61½ | 78½ |
| Elec. Ry. Securities, com.—no par.. | m 6 | 4½ | 10 |
| Elec. Storage Battery, com.—no par. | 93½ | 73 | 93½ |
| Elmira Wtr., Lt. & R. R., 7% pf. | 98 | 97 | 101 |
| Emerson Elec., pf. | m101 | 100 | 104½ |
| Empire Dist. Elec., 6% pf. | l 88 | 82 | 88 |
| Empire Power, A. | 25½ | 21 | 32 |
| Engr. Pub. Serv., pf.—no par. | m 96 | 87 | 96 |
| Engr. Pub. Serv., com.—no par. | m 24 | 24 | 29½ |
| Eureka Vac. Cleaner, com.—no par... | k 52½ | 43 | 56 |
| **FAIRBANKS MORSE, pf.** | k111 | 108½ | 115 |
| Fairbanks Morse, com.—no par | k 52 | 46 | 59½ |
| Federal Lt. & Trac., com. | k 32 | 28 | 39½ |
| Federal Light & Traction, pf. | k 89½ | 86 | 89 |
| Federal Utilities, pf. | 70 | .... | .... |
| Federal Utilities, com. | 17 | .... | .... |
| Ft. Worth Pwr. & Lt., 7% pf. | l107 | 105 | 108½ |
| **GALVESTON-HOUSTON ELEC., 6% pf.** | 53 | .... | .... |
| Galveston-Hstn. El., com. | 19 | .... | .... |
| Gen. Elec., com. | 91 | 79 | 95½ |
| Gen. Elec., special—10. | 11½ | 11 | 11½ |
| Gen. G.&E., (Del.) com. A no par.. | 50½ | 34 | 58 |
| Gen. G.&E., (Del.) com. B no par.. | 45 | 45 | 48½ |
| Gen. G.&E., (Del.) A pf. $8 no par. | k108½ | 105½ | 110½ |
| Gen. G.&E., (Del.) A pf. $7 no par.. | k 97½ | 95 | 99½ |
| Gen. G.&E., (Del.) pf. B. | k 95 | 92½ | 96 |
| General Public Service, pf. | m104 | 90 | 106½ |
| General Public Service, com. | m12½ | 12½ | 16½ |
| Ga. Lt., Pwr., & Rys., 6% pf. | 93 | 77 | 97 |
| Ga. Lt., Pwr. & Rys., com. | 70 | 65 | 80 |
| Ga. Ry. & Power, 8% pf. | 114 | 112 | 114 |
| Ga. Ry. & Power, 7% pf. | 104 | .... | .... |
| Ga. Ry. & Pwr., 4% pf. | 120 | .... | .... |
| Ga. Ry. & Pwr., com. | 120 | 105 | 148 |
| Gt. Western Pwr., 7% pf. | h101 | .... | .... |
| **IDAHO PWR., 7% pf.** | 103 | 62 | 106½ |
| Ill. No. Utilities, 6% pf. | a 90½ | 90 | 92 |
| Ill. Pwr. & Lt., 7% pf. | 99½ | .... | .... |
| Ingersoll Rand | k 95 | 80½ | 104½ |
| Int. Combus. Engr., com.—no par | k 55 | 33½ | 64½ |
| Int. Utilities, class A—no par. | m 30½ | 31 | 39 |
| Int. Utilities, class B—no par. | 4½ | 4½ | 9½ |
| Interstate Pwr., pf., no par. | 92 | .... | .... |
| Interstate Pub. Serv., 7% pf. | 98 | 96 | 99 |
| Iowa Ry. & Lt., 7% pf. | 95 | 93 | 100 |
| **JERSEY CENTRAL PWR. & LT., 7% pf.** | 95 | .... | .... |
| Jersey Central Pwr. & Lt., ptc., pf. | 110 | 94 | 114 |
| Jersey Central Pwr. & Lt., com.—no par | 45 | 45 | 50 |
| Johns-Manville, com.—no par. | 149 | .... | .... |

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Aug. 28. lBid, low, high, Wednesday, Sept. 1. mLatest quotations available.

## Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Tuesday Aug. 31 | Low 1926 | High 1926 |
|---|---|---|---|
| KANSAS CITY PWR. & LT., pf. | k111¼ | 107 | 112¼ |
| Kansas Gas & Elec., 7% pf. | /102½ | 99 | 103 |
| Kentucky Hydro-Elec., pf. | a 95 | 91½ | 95½ |
| Kentucky Sec., 6% pf. | 80 | .. | .. |
| Kentucky Sec., com. | 100 | .. | .. |
| Kentucky Utilities, 6% pf. | a 51½ | 49 | 52½ |
| Keystone Pwr. & Lt. 7% pf. | 96 | 95 | 99 |
| LACLEDE GAS LT., com. | k167 | 146 | 175½ |
| Lehigh Pwr. Sec., com.—no par | 16¾ | 10 | 22 |
| Long Island Ltg., 7% pf. | 107½ | .. | .. |
| Long Island Ltg., com.—no par | 120 | 118 | 130 |
| Los Angeles Gas & Elec., 6% pf. | 98 | .. | .. |
| Louisville Gas & Elec., Class. A | k 24½ | 22½ | 26½ |
| MANHATTAN ELEC. SUPPLY. | k 82 | 56 | 87½ |
| Manila Elec., com.—no par. | k 36 | 27½ | 39½ |
| Maytag Mfg., com. | k 23½ | 19 | 24½ |
| Memphis Pwr. & Lt., pf., $7, no par | 108 | 105 | 108½ |
| Metro. Edison, pf.—$6—no par | 92½ | .. | .. |
| Metropolitan Edison, pf., $7, no par. | 103 | .. | .. |
| Metropolitan Edison, com., no par. | 50 | 45 | 50 |
| Middle West Utilities, 7% pf. | a107 | 97½ | 111½ |
| Middle West Utilities, 7% pr. lien pf. | a116½ | 106½ | 123½ |
| Middle West Utilities, com.—no par | a110½ | 108 | 134½ |
| Midland Utilities, pr. ln. pf. | a102 | 98 | 104 |
| Midland Utilities pf. A | a 99 | 96 | 99½ |
| Milwaukee Elec. Ry. & Lt., 7% pf. | 98 | 100 | 102 |
| Milwaukee Elec. Ry. & Lt., 6% pf. | 91 | 87 | 88½ |
| Minn. Pwr. & Lt., 7% pf. | /103½ | 100 | 104 |
| Miss. Pwr. & Lt., pf. | 104 | .. | .. |
| Miss. River Pwr., 6% pf. | 95 | 93 | 96 |
| Miss. River Pwr., com. | 60 | .. | .. |
| Mohawk Hudson Pwr., 1st pf.—$7—no par | 101½ | 100 | 105 |
| Mohawk Hudson Pwr., 2nd pf.—$7—no par | 99½ | 90 | 97 |
| Mohawk Hudson Pwr., com.—no par | 25½ | 20½ | 28½ |
| Montana Pwr., pf. | m117½ | 112½ | 119½ |
| Montana Pwr., com. | k 79 | 69½ | 83½ |
| Montreal Pwr., com. | f240 | .. | .. |
| Mountain States Pwr. pf. | 97 | .. | .. |
| Mountain States Pwr., com. | 18 | .. | .. |
| NASSAU & SUFFLOK, LTG., pf. | 98 | 93 | 101 |
| National Carbon, pf. | m127½ | 125 | 128 |
| National Electric Pwr-A. | a 23½ | 19½ | 26½ |
| National Elec. Pwr., pf. | a 95½ | 92 | 96½ |
| Nat. Lt., Ht. & Pwr., com. | 24 | 22 | 27 |
| National Lt., Ht. & Pwr., 5% pf. | 72 | 70 | 74 |
| National Pwr. & Lt., pf., $7—no par. | 100 | .. | .. |
| National Pwr. & Lt., com.—no par. | 20½ | 16½ | 38½ |
| National Pub. Serv., 7% pf. | 92 | .. | .. |
| National Pub. Serv., pte. pf. | 109 | .. | .. |
| National Pub. Serv., A com.—no par. | 19½ | 15½ | 24 |
| National Pub. Serv., B com.—no par. | 15½ | 10 | 17½ |
| Nebraska Pwr., 7% pf. | /106 | 103 | 107½ |
| Nevada-Calif., Elec., com. | m 23½ | 18½ | 44½ |
| New Brunswick Pwr., pf. | 55 | 50 | 60 |
| New England Pub. Serv., pr. ln. pf. | 98 | 96 | 100 |
| New England Pub. Serv., pf. | 88 | 88 | 92 |
| N. J. Pwr. & Lt., 7% pf. | 105 | 104 | 107 |
| New Orleans Pub. Serv., 7% pf. | 102 | .. | .. |
| N. Y. & Queens Elec. Lt. & Pwr., 5% pf. | 87 | .. | .. |
| N. Y. Central Elec., 7% pf. | 98 | 96 | 100 |
| Newport News & Hampton Ry., Gas & Elec., com. | 110 | 95 | 112 |
| Newport News & Hampton Ry., Gas & Elec., pf. | 110 | 95 | 112 |
| Niagara Falls Pwr., 7% pf.—25 | k 28½ | 27½ | 28½ |
| Niagara, Lock. & Ont. Pwr., 7% pf. | 109 | 105 | 112 |
| No. Amer., 6% pf.—50 | k 52 | 49 | 52 |
| No. Amer., com.—10 | k 54½ | 42 | 67 |
| No. Amer. Edison pf.—no par | 94½ | 93 | 95 |
| No. Amer. Lt. & Pwr., pf. | 101 | 88 | 104 |
| No. American Utilities, pf., full pd. | m 94½ | 89 | 96 |
| No. American Utilities, pf., 25% pd. | m 19 | 18 | 27 |
| N.C Pub. Serv., pf.—$7—no par. | 93 | .. | .. |
| Northeastern Pwr., com. | 19 | 17½ | 36½ |
| No. Indiana Gas & Elec., pf. A | 100 | 98 | 103 |
| No. Indiana Public Service—pf. | 100½ | 99 | 103 |
| No. N. Y. Utilities, 7% pf. | 104 | .. | .. |
| No. Ohio Pwr., com.—no par | 15 | 11 | 26½ |
| No. Ohio Trac. & Lt., 6% pf. | 80 | 77 | 83 |
| No. Ohio Trac. & Lt., 7% pf. | 94 | 90 | 95 |
| No. Ont. Lt. & Pwr., pf. | 82 | 78 | 84 |
| No. Ont. Lt. & Pwr., com. | 73 | 45 | 75 |
| No. States Pwr., 7% pf. | 101½ | .. | .. |
| No. States Pwr. com. | 104 | .. | .. |
| No. Texas Elec., 6% pf. | 20 | .. | .. |
| No Texas Elec., com. | 54 | .. | .. |
| OHIO BRASS, com. B—no par | 73 | 72 | 78 |
| Ohio Brass, pf. | 101 | 100 | 104 |
| Ohio Gas & Elec., 7% pf. | 95 | 90 | 97 |
| Ohio Pwr., 6% pf. | 94½ | 93 | 96½ |
| Ohio Pub. Serv., 6% pf. | l 94 | 90 | 96 |
| Ohio Pub. Serv., 7% pf. | l 99 | 96 | 100 |
| Ohio River Edison, pf. | 101½ | .. | .. |
| Oklahoma Gas & Elec., pf. | 96 | .. | .. |
| PACIFIC GAS & ELEC., 6% pf. | 100½ | .. | .. |
| Pacific Gas & Elec. com. | k130½ | 118 | 132½ |
| Pacific Pwr. & Lt., 7% pf. | /102 | 98 | 102½ |
| Parr Shoals Pwr., 6% pf. | 92 | 90 | 95 |
| Penn Central Lt & Pwr., pf.—no par | c 72½ | 71 | 91 |
| Penn-Ohio Edison, 7% pf. | 95 | .. | .. |
| Penn-Ohio Elec., 7% pf. | 96 | 93 | 98 |
| Penn-Ohio Pwr. & Lt., 7% pf. | 96 | 94 | 98 |
| Penn-Ohio Pwr., & Lt., 8% pf. | 107 | 105 | 108 |
| Penn Pwr. & Lt.—$7—no par | /107 | 103 | 108½ |
| Penn Pub. Serv., 7% pf. | 103 | 100 | 103 |
| Penn Pub. Serv., 6% pf. | 85 | 85 | 90 |
| Penn Wtr. & Pwr., com. | m155 | 141 | 171 |
| Phila. Co., 6% pf.—50 | k 50 | 47½ | 51½ |
| Phila. Co., com.—50 | k 74 | 59½ | 76½ |
| Phila. Elec., com.—25 | c 50½ | 41½ | 67½ |
| Pittsburgh Utilities, pf.—10 | m 17 | 14½ | 20½ |
| Portland Elec. Pwr., 7% pf. | 102½ | .. | .. |
| Portland Elec. Pwr., 6% pf. | 84 | 71 | 80 |
| Portland Elec. Pwr., 6% 2nd pf. | 72 | 71 | 75 |
| Portland Elec. Pwr., com. | 31 | .. | .. |
| Potomac Elec. Pwr., pf. | /107 | .. | .. |
| Pwr. Corp. of N.Y., com—no par. | m 79 | 77½ | 90½ |
| Pwr. Sec., pf.—no par. | 10 | 10 | 29 |
| Pwr. Sec., com.—no par. | 4 | 4 | 13 |
| Pub. Serv. of N. J., 7% pf. | k108½ | 103½ | 109½ |
| Pub. Serv. of N. J., 8% pf. | k121 | 115 | 122 |
| Pub. Serv. of N. J., com.—no par. | k 92½ | 72 | 93½ |
| Pub. Serv. of No. Ill., 6% pf. | a103½ | 100½ | 106 |
| Public Serv. of No. Ill., 7% pf. | a114 | 112 | 116½ |
| Pub. Serv. of No. Ill., com.—no par | a132½ | 128½ | 140 |
| Pub. Serv. of No. Ill., com. | a133 | 129½ | 143 |
| Pub. Serv. of Okla., 7% pf. | 96 | 95 | 100 |
| Pub. Serv. Elec. & Gas, 6% pf. | k103½ | 97 | 104 |
| Public Service Elec. Pwr., pf. | k113 | 106 | 114 |
| Puget Sound Pwr. & Lt., 7% pf. | 102 | .. | .. |
| Puget Sound Pwr. & Lt., 6% pf. | 84 | .. | .. |
| Puget Sound Pwr. & Lt., com. | 27½ | .. | .. |
| RADIO CORP. OF AM., pf.—50 | k 46½ | 32 | 48½ |
| Radio Corp. of Amer., com.—no par. | k 46½ | 32 | 48½ |
| Republic Ry. & Lt., pf. | 106 | .. | .. |
| Republic Ry. & Lt., com. | 78 | .. | .. |
| Rochester Gas & Elec., 5% pf. | 95 | 80 | 98 |
| Rochester Gas & Elec., 6% pf. | 101½ | .. | .. |
| Rochester Gas & Elec., 7% pf. | 104 | 103 | 107 |
| SAN JOAQUIN LT. & PWR., 7% pf. | 98 | 96½ | 99 |
| Safety Cable, com. | 52 | 42½ | 54½ |
| St. Joseph Ry., Lt., Ht. & Pwr., pf. | 68 | 65 | 70 |
| Servel Corp., | 17½ | 17½ | 22½ |
| Sierra Pacific Elec., com. | 27 | .. | .. |
| Sioux City Gas & Elec., 7% pf. | 98½ | 96 | 101 |
| S. E. Pwr. & Lt., pf.—$7—no par. | l 99½ | .. | .. |
| Southeastern Pwr. & Lt., pfc. pf. | l 66 | .. | .. |
| S. E. Pwr. & Lt., com.—no par. | 28½ | 20 | 46½ |
| So. Calif. Edison, 8% pf.—25 | 32 | 30 | 35 |
| So. Calif. Edison, 7% pf.—25 | 27½ | .. | .. |
| So. Calif. Edison, 6% pf.—25 | 24½ | .. | .. |
| So. Calif. Edison, com. | 31½ | 30½ | 33 |
| Southern Cities Utilities, 7% pf. | 87 | .. | .. |
| Southern Cities Utilities, com. | 34 | .. | .. |
| Southwestern Lt. & Pwr., A. | 60 | 52 | 60 |
| Southwestern Lt. & Pwr., B. | 58 | 38 | 58 |
| Southwestern Lt. & Pwr., $6 pf. | 79 | 78 | 82 |
| Southwestern Pwr. & Lt., 7% pf. | 102½ | 100 | 105 |
| Springfield (Mo.) Ry & Lt., 7% pf. | 97 | 97 | 100 |
| Standard Gas & Elec., 8% pf. | 57 | 53½ | 57½ |
| Standard Gas & Elec., 7% pf. | 103 | .. | .. |
| Standard Gas & Elec., com.—no par. | 54½ | 51 | 69 |
| Standard Pwr. & Lt., 7% pf. | 95 | .. | .. |
| Staten Island Edison, pf.—$6—no par | 96 | .. | .. |
| Superheater, com.—no par. | 158 | 138 | 165 |
| Syracuse Lighting, 7% pf. | 107 | 105 | 110 |
| Syracuse Lighting, 8% pf. | 115 | 113 | 119 |
| Syracuse Lighting, com. | 340 | 330 | 355 |
| TAMPA ELEC., com. | 50 | .. | .. |
| Tenn. Elec. Pwr., 6% pf. | 89 | .. | .. |
| Tenn. Elec. Pwr., 7% pf. | 102½ | .. | .. |
| Terre Haute, Ind. & East Trac., pf. | 15 | 15 | 35 |
| Terre Haute, Ind. & East. Trac., com | 1 | 1 | 9 |
| Tex. Pwr. & Lt., 7% pf. | /107 | 102 | 106½ |
| Tide Water Pwr., 8% pf. | 101 | .. | .. |
| Timken Roller Bearing, com—no par | 60 | 44½ | 62½ |
| Toledo Edison, 8% pf. | /113 | 111 | 113 |
| Toledo Edison, 7% pf. | /102½ | 101 | 103 |
| Toledo Edison, com. | 100 | .. | .. |
| Tri-City Ry. & Lt., 6% pf. | 88 | 85 | 92 |
| UNITED GAS & ELEC., 6% pf. | 97 | .. | .. |
| United Gas & Elec., com.—no par | m 57 | 56 | 66 |
| United Gas & Elec. (N.J.), 5% pf. | 70 | .. | .. |
| United Gas Impr.—50 | c112 | 84½ | 144½ |
| United Lt. & Pwr. pf.—$4—no par. | 50½ | 46 | 52½ |
| United L. & P. pf.—$6.50—no par. | 88 | 84 | 93 |
| United Lt. & Pwr., com., A—no par | a 15½ | 13½ | 26 |
| United Lt. & Pwr., com., B—no par | a 20 | 15 | 31 |
| Utah Pwr. & Lt., 7% pf. | /102 | 99 | 103½ |
| Utica Gas & Elec., 7% pf. | /04½ | 103 | 106 |
| Utica Gas & Elec., com. | 205 | .. | .. |
| Utilities Pwr. & Lt., 7% pf. | 92 | .. | .. |
| Utilities Pwr. & Lt., com A. | 30 | 28½ | 37 |
| Utilities Pwr. & Lt., com. B—no par. | 14 | 13½ | 18½ |
| VERMONT HYDRO - ELEC., 7% pf. | 95 | 93 | 96 |
| Virginia Elec. & Pwr., 7% pf. | 104 | 102 | 105 |
| Virginia Pwr., 7% pf. | 108 | 102 | 104 |
| Virginian Pwr., com. | 70 | 65 | 75 |
| WAGNER ELEC., pf. | m 68 | 61½ | 85 |
| Wagner Elec., com.—no par. | b 17 | 13½ | 34½ |
| Washington Ry. & Elec., com. | /190 | .. | .. |
| Washington Ry. & Elec., pf. | / 89½ | .. | .. |
| Washington Wtr. Pwr., com. | 134 | 132 | 137 |
| West Mo. Pwr., 7% pf. | 92 | .. | .. |
| West Penn., 7% pf., temp. ctfs. | m100 | 95½ | 101 |
| West Penn, com. | m125 | 118 | 130 |
| West Penn Elec., pf. | k100 | 95½ | 100½ |
| West Penn Elec., Class A. | k 96 | 88½ | 97 |
| West Penn Pwr., pf. | k111 | 108 | 112 |
| West Va. Lt., Ht. & Pwr., 7% pf. | 94½ | 9-½ | 96½ |
| West Va. Utilities, 7% pf.—50 | 46 | 42 | 50 |
| Western Pwr., 7% pf. | 94 | .. | .. |
| Western States Gas & Elec., 7% pf. | 92 | 89 | 94 |
| Western States Gas & Elec., com. | 16 | .. | .. |
| Westinghouse El. & Mfg., com—50 | 70½ | 65 | 79½ |
| Weston Elec. Instrument, Class A. | k 31½ | 27½ | 32½ |
| Weston Elec. Instrument, com. | 17½ | 13½ | 19½ |
| Wheeling Elec., pf. | 96 | 92 | 98 |
| Wis. Pwr., Lt. & Ht., 7% pf | 95 | 85 | 90 |
| Worthington Pump, pf. A. | k 70 | 66 | 80 |
| Worthington Pump, pf. B. | k 54 | 53 | 65 |
| Worthington Pump, com. | k 27½ | 20½ | 44½ |
| YADKIN RIVER PWR., 7% pf. | /107 | 102 | 107½ |
| Yale & Towne, com.—25 | 68½ | 60½ | 69 |

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Saturday, Aug. 28. lBid, low, high, Wednesday, Sept. 1. mLatest quotations available.

tric Company first mortgage 6's, 1939; Pacific Light & Power Company first mortgage 5's, 1942; Pacific Light & Power Company first and refunding mortgage 5's, 1951; Santa Barbara Gas & Electric Company first mortgage (serial) 5's, 1941; Southern California Edison Company general mortgage 5's, 1939; Southern California Edison Company general and refunding mortgage 5's, 1944; Southern California Edison Company general and refunding mortgage 5½'s, 1944; Southern California Edison Company general and refunding mortgage 6's, 1944; Southern California Edison Company gold debentures (serial) 7's, 1928.

Toledo Edison Company: Toledo Gas, Electric & Heat Company consolidated mortgage 5's, 1935.

The first list issued, containing 44 items, was printed in the ELECTRICAL WORLD for Aug. 21, page 398.

**Southern California Edison Company Earnings.**—A comparative statement of the earnings of the Southern California Edison Company for the twelve months ended July 31 shows gross earnings of $26,424,911, as compared with $22,937,565 for the same period in the preceding year; total expenses and taxes of $8,978,499, as compared with $10,619,816; total net income of $17,446,412, as compared with $12,317,749, and fixed charges of $6,441,557, as compared with $5,017,614. This leaves a balance of $11,004,855, as compared with $7,300,134, an increase of 51 per cent.

## New Capital Issues

During the week ended Sept. 2 the Public Service Company of Oklahoma made an offering of 36-year first mortgage 5 per cent gold bonds, series C, involving $4,750,000. These bonds were priced at 98 and interest, yielding over 5.10 per cent. The proceeds of these bonds will be used to retire the entire outstanding funded debt of the company, which will effect a substantial saving in interest charges, and for other corporate purposes. The company supplies electricity without competition to Tulsa and 28 other communities in Oklahoma. The company also supplies ice to several communities. The population of the communities served is approximately 175,000. The operations of the company are controlled by the Middle West Utilities Company.

A. C. Allyn & Company are offering an additional issue of $969,000 Florida Public Service Company first mortgage 6 per cent gold bonds, series B, at 100 and accrued interest to yield 6 per cent. The annual interest requirements on the first mortgage bonds, including this issue, amount to $323,710. The Florida Public Service Company supplies electric light and power to 58 communities in central Florida. For the twelve months ended July 31, 1926, net earnings of the company were $608,587. The company is controlled by the General Gas & Electric Corporation and is operated and managed by the W. S. Barstow Management Association, Inc.

Twenty-year 5 per cent gold bonds of the Westinghouse Electric & Manu-

facturing Company amounting to $30,000,000 have been offered at 99 per cent and accrued interest. The purpose of this issue is to provide part of the funds necessary to pay $30,000,000 principal amount of this company's 7 per cent gold bonds, which are to be called for redemption on Nov. 1 next, thus reducing the company's fixed charges.

## Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

| Name of Company | Per Cent | When Payable |
|---|---|---|
| American Superpower, com. A & B. | 0.30 | Oct. 1 |
| American Superpower, 1st pf. | 1.50 | Oct. 1 |
| American Utilities, pf. | 1.75 | Sept. 1 |
| Canadian General Electric, pf. | 1¾ | Oct. 1 |
| Chickasha Gas & Electric, pf. | 1¾ | Oct. 1 |
| Chickasha Gas & Electric, com. | 2 | Oct. 1 |
| Chicago Fuse | .62½ | Oct. 1 |
| Electric Power & Light, pf. | 1.75 | Oct. 1 |
| General Electric | .75 | Oct. 28 |
| General Gas & Electric, $8, pf. A | 2.00 | Oct. 1 |
| General Gas & Electric, $7, pf. A | 1.75 | Oct. 1 |
| General Gas & Electric, cum. pf. B | 1.75 | Oct. 1 |
| General Gas & Electric, com. A | .37½ | Oct. 1 |
| Interstate Power, pf. | 1.75 | Oct. 1 |
| Kansas City Power & Light (Mo.) 1st pf. A | 1.75 | Oct. 1 |
| Kentucky Hydro-Electric, pf. | 1.75 | Sept. 20 |
| Montana Power, com. | 1.25 | Oct. 1 |
| Montana Power, pf. | 1.75 | Oct. 1 |
| Municipal Service, pf. No. 1 | .50 | Oct. 1 |
| National Power & Light, pf. | 1.75 | Oct. 1 |
| New England Pub. Serv., com. No. 1 | .75 | Sept. 15 |
| New England Public Service, pf. | 1.75 | Sept. 15 |
| North American, pf. | .75 | Oct. 1 |
| North American com. | .25 | Oct. 1 |
| Ottawa & Hull Power, pf. | 1¾ | Sept. 15 |
| Pennsylvania Gas & Electric, com. | 1½ | Oct. 1 |
| Pennsylvania Gas & Electric, pf. | 1¾ | Oct. 1 |
| Pennsylvania Water & Power | 2 | Oct. 1 |
| People's Light & Power, 7% pf. | 7-12 | Sept. 10 |
| Public Service of Oklahoma, pr. ln | 1¾ | Oct. 1 |
| Public Service of Oklahoma, pf. | 1¾ | Oct. 1 |
| Public Service of Oklahoma, com. | 2 | Oct. 1 |
| Shawinigan Water & Power | 2 | Oct. 1 |
| Worthington Pump & Mach., pf. A | 1¾ | Oct. 1 |
| Worthington Pump & Mach., pf. B | 1½ | Oct. 1 |

**Associated Gas Net Up 261 per Cent in Year.**—Gross earnings of the Associated Gas & Electric Company in the year ended June 30 were $26,848,635, against $9,420,516 in the period a year previous, an increase of 185 per cent. Net earnings after expenses, maintenance, taxes, net earnings applicable to minorities and amortization were $11,439,517, against $3,165,254, an increase of 261 per cent. After interest, priority dividends, preferred dividends and setting aside $1,512,373 computed on the schedule of rates for depreciation suggested by the company's bankers, there was available for class A dividends $2,008,462, or more than three and one-half times the $565,741 required for this purpose, leaving a balance of $1,442,721, against $426,849 in the preceding period, which is an increase of 238 per cent.

**Progress of Indiana Electric Corporation Merger.**—Securities of the Indiana public utility companies which are to be merged into the Indiana Electric Corporation deposited for exchange under the plan of consolidation now amount to more than $25,500,000, according to Robert I. Todd, president of the Terre Haute, Indianapolis & Eastern Traction Company, which is to be consolidated with the Central Indiana Power Company and subsidiaries. The sum represents more than 65 per cent of the securities involved in the merger, and the securities have been deposited within three months after the announcement of the plan to consolidate. "If the present rate of deposit continues, the actual consolidation can be effected soon," Mr. Todd said. The securities already on deposit represent the larger investors and most of the securities not yet deposited are in small holdings.

## Company Reports

The following statements of earnings have been issued by electric light and power companies for the month ended July 31:

| Name of Company | Gross Earnings for July 1926 | Gross Earnings for July 1925 |
|---|---|---|
| Arkansas Central Power* | $181,624 | $173,915 |
| Binghamton Lt., Ht. & Pwr. | 135,008 | 131,534 |
| Birmingham Electric* | 745,695 | 670,179 |
| Brazilian Trac., Lt. & Pwr. | 3,531,663 | 2,560,132 |
| Broad River Power | 166,959 | 111,082 |
| Central Maine Power | 404,689 | 393,927 |
| Cities Service | 1,897,312 | 1,603,727 |
| Electric Power & Light | 4,008,654 | 3,640,282 |
| Florida Public Service | 122,611 | 75,841 |
| General Gas & Electric | 1,845,286 | 1,600,415 |
| Houston Lighting & Power* | 381,589 | 319,083 |
| Kansas City Power & Light | 784,669 | 751,354 |
| Knoxville Power & Light* | 208,238 | 193,184 |
| Memphis Power & Light* | 390,420 | 359,569 |
| Metropolitan Edison | 738,561 | 671,097 |
| Nevada-California Electric | 476,384 | 485,051 |
| New Bedford Gas & Edison Lt. | 317,151 | 313,332 |
| New Jersey Power & Light | 189,586 | 102,610 |
| North Carolina Public Service | 173,105 | 144,148 |
| Northern Ohio Power | 929,364 | 933,762 |
| Northern Pennsylvania Power | 55,987 | 49,369 |
| Portland Electric Power | 945,492 | 893,871 |
| Philadelphia Company | 4,504,236 | 4,309,075 |
| Public Service of New Jersey | 8,204,844 | 7,164,852 |
| Republic Railway & Light | 1,000,702 | 847,071 |
| Southern California Edison | 2,714,896 | 2,333,502 |
| Tennessee Electric Power (including Nashville Railway & Light) | 928,552 | 912,479 |
| Utah Power & Light* | 820,239 | 768,798 |
| Washington Railway & Elec. | 403,895 | 394,986 |

* June

## Central-Station Security Issues in August Amount to $49,759,000

During the month of August the central stations of the country raised $49,759,000 by the flotation of new issues of stock, bonds and notes. This figure compares with $109,076,040 for the month of July and with $47,525,000, the total recorded for August, 1925. None of these totals includes local sales to customers and employees. The largest individual offering was made by the North American Light & Power Company in the form of sinking-fund gold debentures amounting to $15,000,000. The rate of return yielded the investor 6 per cent, an increase over that of July, which was 5.54 per cent.

## Security Issues of Electric Service Companies in August

| Name of Company | Amount of Issue | Period Years | Class | Purpose | Interest Rate | Price | Per Cent Yield |
|---|---|---|---|---|---|---|---|
| Jersey Central Power & Light Co. | $3,500,000 | 20 | First mortgage and refunding sinking-fund gold bonds, series A | To reimburse for expenditures on additions and new construction | 5½ | 98 | 5.65 |
| Electric Public Service Co. | 2,000,000 | 15 | Secured gold bonds, series B | To provide funds for acquisition of property and for other corporate purposes | 6 | 98 | 6.20 |
| | 900,000 | 3 | Gold notes | Acquisition of property and for other corporate purposes | 6 | 99 | 6.35 |
| Midland Utilities Co. | 5,000,000 | 3–5 | Gold notes | To reimburse treasury for funds used in development of subsidiaries and for other corporate purposes | 5 | 99½ to 98⅝ | 5.17 to 5.30 |
| North American Light & Power Co. | 15,000,000 | 30 | Sinking-fund gold debentures, series A | To retire securities, to furnish additional working capital and for other corporate purposes | 5½ | 94½ | 5.90 |
| Nevada-California Electric Corp. | 3,000,000 | 15 | Gold debentures | To retire securities, to defray the cost of new construction and for general corporate purposes | 6 | 99 | 6.10 |
| Northern Electric Co. | 3,000,000 | 3 | First mortgage gold bonds | To acquire properties, complete building of dams, generating stations, transmission lines and necessary auxiliary apparatus and acquire lands and rights as required | 6 | 99 | 6.38 |
| Indiana Service Corp. | 700,000 | .. | Preferred stock | | 6 | 92½ | 6.50 |
| Derby Gas & Electric Corp. | 1,440,000 | .. | Preferred stock | For the acquisition of stock, the retirement of underlying securities and for other corporate purposes | 7 | 96 | 7.29 |
| National Power & Light Co. | 9,500,000 | 100 | Gold debentures, series A | To take precedence as to earnings and assets over 140,298 shares $7 preferred stock and $2,545,815 common stock | 6 | 98 | 6.10 |
| Florida Public Service Co. | 969,000 | .. | First mortgage gold bonds, series B | | 6 | 100 | 6 |
| Public Service Co. of Oklahoma | 4,750,000 | 35 | First mortgage gold bonds, series C | To retire entire outstanding debt and for other corporate purposes | 5 | 98 | 5.10 |
| Total | $49,759,000 | | | | | | |

# Manufacturing and Markets

## Distribution of Electrical Products

### Balance Sheet Struck by Trade Policy Committee of Association of Electragists Determines Sizes of Channels of Distribution and Contractor-Dealers' Status

THE fourth economic research of the trade policy committee of the Association of Electragists International, in studying the conditions which hinder the more complete realization of that policy, was presented by W. Creighton Peet, chairman of the committee, at the twenty-sixth annual convention of the association, held at Cedar Point, Ohio, last week. The trade policy of the association states that the most economic and efficient method of distribution of electrical products comes where those products move from manufacturer through jobber to the contractor and dealer and thence to the consumer. The present study was made to determine the relative sizes of the several channels of distribution and to determine definitely the contractor-dealers' status. The table showing "the balance sheet of distribution" is a summary of detailed facts gathered by the committee. Mr. Peet in his report says: "The contractor-dealers purchase approximately 85 per cent through electrical supply jobbers. Taking their purchases of $181,000,000 from the jobbers' total in the 'interested field' of $292,000,000, we find that there is left $111,000,000 which the jobber sells to central stations, non-electrical stores and in competition with his customers to industrials, over the counter and through the route of courtesy discounts.

"That the contractor-dealer buys but 15 per cent of his materials and supplies direct from manufacturer should silence the criticism that we have not played the game according to our rules. The 'balance sheet' shows that there were $152,500,000 worth of materials that the manufacturer sold without the aid of either electrical jobber or contractor-dealer, and there was a total of $111,000,000 which the jobber sold without the aid of the contractor-dealer.

#### COMPETITIVE CHANNELS

"Two hundred and sixty-three million dollars' worth of electrical products reached their ultimate destination without passing through the contractor-dealer's hands. The central-station merchandising department sold some, the non-electrical store some, the radio dealer some. How large a proportion each of these outlets handled we do not know, nor do we feel that there should be any complaint about their participation in the market provided they merchandise in a fair manner. There is, however, a large part of this $263,000,000 which represents direct competition by the manufacturer and the jobber with the contractor-dealer. The contractor-dealer absorbs approximately 45 per cent of all the materials in the groups in which he is interested. He would do more except that he has the following legitimate competition: (1) Central-station merchandising department; (2) non-electrical stores and specialty stores; (b) radio stores; while his illegitimate competition is from (4) electrical manufacturers selling direct to consumers, and (5) electrical jobbers selling direct to consumers.

"Our further efforts will be to try to understand what brought such a situation about and how it can be remedied. But as these figures began to be unfolded to your committee we were particularly at a loss to understand why the electrical supply jobber, two-thirds of whose business comes from the contractor-dealer, should jeopardize that business by competing with this customer, more especially when it is understood that the jobber's trade with central stations and non-electrical retail outlets is bound to be very short-lived.

"The manufacturer wants to sell more of his products, the central stations are keen to increase their load, and the jobber wants more business. It is the opinion of your trade policy committee that the electragist, with his daily—yes, hourly—contact with the consumer, his close, intimate and, we hope, friendly contact with the con-

### Value of Electrical Exports for July, 1926, Compared with Corresponding Month in 1925

(Issued by Bureau of Foreign and Domestic Commerce)

| Articles | July 1925 | July 1926 |
|---|---|---|
| Generators: | | |
| Direct-current: | | |
| Under 500 kw. | $69,343 | $78,841 |
| 500 kw. and over | 65,110 | 130,983 |
| Alternating current: | | |
| Under 2,000 kva. | 18,556 | 17,803 |
| 2,000 kva. and over | 196,594 | 128,097 |
| Steam turbo-generator sets. | 13,767 | 47,348 |
| Accessories and parts for generators | 120,923 | 65,588 |
| Self-contained lighting outfits | 87,660 | 78,901 |
| Batteries: | | |
| Flashlight batteries | 96,219 | 129,715 |
| Other primary batteries | 136,048 | 212,669 |
| Storage batteries | 193,271 | 258,517 |
| Transforming or converting apparatus: | | |
| Power transformers | 180,043 | 211,108 |
| Other transformers | 66,988 | 124,082 |
| Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters | 29,642 | 63,115 |
| Transmission and distribution apparatus: | | |
| Switchboard panels, except telephone | 272,919 | 71,678 |
| Switches and circuit breakers over 10 amp. | 95,855 | 283,332 |
| Fuses and fuse blocks | 32,289 | 36,583 |
| Watt-hour and other measuring meters | 30,546 | 56,710 |
| Volt, watt and ampere meters and other recording, indicating and testing apparatus | 84,936 | 154,593 |
| Lightning arresters, choke coils, reactors and other protective devices | 55,709 | 49,051 |
| Motors, starters and controllers: | | |
| Motors under 1 hp. | 154,407 | 167,754 |
| Stationary motors: | | |
| 1 to 200 hp. | 147,629 | 313,651 |
| Over 200 hp. | 15,433 | 75,624 |
| Railway motors | 43,064 | 128,569 |
| Electric locomotives: | | |
| Railway | 14,525 | ..... |
| Mining and industrial | 21,093 | 19,518 |
| Starting and controlling equipment: | | |
| For industrial motors | 86,471 | 129,958 |
| For electric railway and vehicle motors | 22,634 | 25,034 |
| Portable electric tools | ..... | 53,868 |
| Accessories and parts for motors | 206,347 | 219,890 |
| Electric appliances: | | |
| Electric fans | 97,263 | 79,373 |
| Electric lamps: | | |
| Metal filament | 107,650 | 161,771 |
| Other electric lamps | 13,056 | 19,575 |
| Flashlights | 120,424 | 166,545 |
| Searchlights and projectors | 71,411 | 50,070 |
| Motor-driven household devices | 90,597 | 127,189 |
| Domestic heating and cooking devices | 99,926 | 115,876 |
| Industrial electric furnaces and ovens | 12,276 | 25,277 |
| Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc. | 123,110 | 126,241 |
| Signal and communication devices: | | |
| Radio apparatus | 643,463 | † |
| Transmitting sets and parts | * | 35,239 |
| Receiving sets | * | 128,918 |
| Tubes | * | 79,978 |
| Receiving set components | * | 129,963 |
| Receiving set accessories | * | 127,644 |
| Telegraph apparatus | 35,500 | 114,162 |
| Telephone apparatus: | | |
| Magneto telephones | 9,772 | 2,739 |
| Other telephones | 54,776 | 52,098 |
| Telephone switchboards | 50,555 | 149,790 |
| Other telephone equipment | 158,744 | 220,923 |
| Railway signals, switches, and attachments | 50,227 | 34,372 |
| Bells, buzzers, annunciators and alarms | 17,080 | 30,472 |
| Other electric apparatus: | | |
| Spark plugs, magnetos and other ignition apparatus | 287,916 | 172,834 |
| Insulating material | 131,661 | 102,226 |
| Metal conduit, outlet and switch boxes | 53,356 | 113,510 |
| Sockets, receptacles and lighting switches | 147,020 | 140,697 |
| Electric lighting fixtures, interior and street | 93,200 | 117,884 |
| Other wiring supplies and line material | 77,899 | 84,854 |
| Other electric apparatus, not elsewhere stated | 514,617 | 660,783 |
| Rubber and friction tape | * | 38,972 |
| Globes and shades for lighting fixtures | 40,754 | 45,545 |
| Electrical glassware except for lighting | 25,308 | 28,901 |
| Electrical porcelain: | | |
| For less than 6,600 volts | 83,075 | 67,801 |
| For 6,600 volts and over | 61,077 | 65,856 |
| Carbons, carbon brushes and electrodes: | | |
| Electrodes for electric furnaces | 33,712 | 111,422 |
| Other carbon products | 205,866 | 121,608 |
| Insulated wire and cable (iron and steel) | 10,171 | 34,594 |
| Copper, bare wire | 93,429 | 331,375 |
| Copper, insulated wire and cable | 361,149 | 392,487 |
| Total electrical machinery and apparatus and supplies | $6,434,161 | $7,942,144 |

*Not separately stated prior to Jan. 1, 1926.
†Discontinued from Jan. 1, 1926.

THE BALANCE SHEET OF DISTRIBUTION

| | | |
|---|---|---|
| Total electrical products manufactured | | $1,398,058,686 |
| Products not intended for retail distribution: | | |
| Exports | $72,148,232 | |
| Products absorbed in power plants, transmission lines, substations, mines, industrial power plants, railways, telephone and telegraph industry, automotive industry, radio and wireless, naval equipment, assemblies for manufacture of other products, etc. | 849,812,493 | 921,960,725 |
| Balance for retail distribution of interest to contractor-dealers | | $476,097,961 |
| **Manufacturers** | | |
| Sold by manufacturers direct through central stations, non-electrical jobbers, industrial and commercial consumers, non-electrical retail outlets and direct retail sales to public | $152,500,000 | |
| Sold by manufacturers direct to contractor-dealers | 31,500,000 | 184,000,000 |
| Balance distributed through jobbers | | $292,000,000 |
| **Electrical Supply Jobbers** | | |
| Total volume of business | $312,000,000 | |
| Deduct business not of interest to contractor-dealers: Automotive business, batteries, auto lamps, mining equipment, electric railway business, etc. | 20,000,000 | 292,000,000 |
| Jobbers' sales through central stations, non-electrical stores, industrials, retail sales and courtesy discounts | | 111,000,000 |
| Jobbers' sales through contractor-dealers | | 181,000,000 |
| **Contractor-Dealers** | | |
| Total volume of purchases | $212,500,000 | |
| Purchased direct from manufacturers | 31,500,000 | |
| Total purchased from jobbers | | $181,000,000 |

sumer, is in the best and most strategical position to bring about the increase in business desired at the most economical cost.

PRICE CONCESSIONS

"Direct solicitation of retail sales by the manufacturer's or jobber's representatives is not only uneconomical from the standpoint of retail distribution, but sets up a competition between such manufacturers or jobbers themselves which invariably results in the giving to the consumer of unwarranted price concessions disastrous both to the manufacturer or jobber and the legitimate retailer, the contractor-dealer.

"Such price concessions to the consumer tend to leave the contractor-dealer but one recourse to meet such competition—the substitution of competitively priced products. So long as the manufacturer or jobber solicits the business of the contractor-dealer's customer at prices lower than are consistent with retail selling, there can be little complaint against the contractor-dealer for seeking his salvation through such substitution.

"Furthermore, we believe that manufacturers and jobbers will find, after deducting the sales expenses and the losses occasioned by competitive price concessions, that there is little or no profit in their sales direct to the users. One very excellent example of such unprofitable business is that of direct motor sales to the users by the manufacturer. We are frequently asked by our members if there is not some way by which the policy of distribution 'from manufacturer through jobber, through contractor-dealers to consumer' cannot be forced upon the other groups of the industry. There is but one answer to this question—no.

THE FINAL SOLUTION

"Unsatisfactory trade polices which have grown up are the result of an interlocking chain of thoughtless practices to which the electragist frequently has been as much a party as any other group. These unsatisfactory practices vary greatly with local conditions, and the correction of them lies in an unselfish, broad-minded, fair and intelligent effort on the part of our members to meet with their jobbers and central-station representatives. These meetings should be frequent and wholehearted, and every effort should be made to bring all the facts before such meetings. If such an effort is made, and the electragists display willingness to correct practices on their part which have encouraged unsatisfactory distribution methods, we are certain that a real response will be found from the other groups. It will then be a simple and entirely practical procedure for each electragist to place his business and his support with fair-dealing concerns.

"There is no law compelling you to trade with concerns whose policies are opposed to your interests. You cannot, on the one hand, trade with such concerns to gain unimagined saving of a few dollars on your purchases and, on the other hand, expect that the policy they represent, and which you complain of, will be corrected by some force outside of yourself. The final solution of distribution problems can never be found unless the world is to reach a state of absolute stability without progress, without change. But interchange of thought and a common study of our conditions will establish confidence and a mutual respect which is the foundation of fair dealing in business."

## A.E.S.C. Approves Industrial Safety Codes

Initiation of work on a national safety code for amusement parks, which will include specifications for the construction, operation and inspection of amusement devices, is announced by the American Engineering Standards Committee. The committee has also announced the approval of several important industrial safety codes. These form part of a comprehensive group of 60 such codes which during the last seven years have engaged the attention not only of the committee but of more than a hundred national organizations which have been officially co-operating in the development of this safety code program. More than a third of the group of 60 codes have now been completed and approved. Codes for protection against dust explosions, a safety code for paper and pulp mills and a code embodying requirements for safe gas-fitting and gas-appliance installation have also been approved by the committee.

# Business Conditions

MANY inquiries received from various central-station companies presage an active fall business from such sources. Present power-company business is mainly for material for the rehabilitation and extension of newly acquired distribution systems. Industrial business continues to be active virtually throughout the country and is made up of many small orders in steady succession which in the aggregate is maintaining a healthy volume of business.

In New England buying is quiet but many inquiries are reported by manufacturers. Sales of material for new construction requirements are in good volume and indications are that industrial lighting equipment will have a period of exceptional business activity. Industrial sales continue active in the New York district and consists of steady buying in small quantities. Central-station companies are not large buyers but an increasing number of inquiries are being received from such sources. In the Southeast line construction materials continue to be active. Orders were placed for the materials for a 400-mile transmission line, and several purchases of interest were made by industrial companies. A textile manufacturer placed an order for $25,000 worth of transformers and $20,000 worth of motors. Conditions are spotty in the St. Louis district but business is fair. Wire and cable have been in active demand and some sizable shipments were made to Tennessee, Arkansas and Texas. A good volume of business is maintained in the Middle West, and numerous small orders were placed by utility companies for material for construction work under way. On the Pacific Coast power companies are quiet but industrial plants have placed a number of orders. Several small motor orders were placed in Seattle and one of considerable proportions was also awarded.

### Prices on Metal Market Firm—Sales in Fair Volume

Prices are firm on the non-ferrous metal markets and sales were fairly active. The cheap lots of copper, which sold a week ago at 14¼ cents delivered in the Connecticut valley, were all absorbed in a day or two. Zinc has been

NEW YORK METAL MARKET PRICES

| | Aug. 25, 1926 Cents per Pound | Sept. 1, 1926 Cents per Pound |
|---|---|---|
| Copper electrolytic | 14.275 | 14.40 |
| Lead, Am. S. & R. price | 8.90 | 8.90 |
| Antimony | 15¼ | 15¼ |
| Nickel, ingot | 35 | 35 |
| Zinc spots | 7.70 | 7.75 |
| Tin, Straits | 65¼ | 66¼ |
| Aluminum, 99 per cent | 27¼ | 27½ |

Base copper price Sept. 1, 1926, 16½ cents.

firm at 7.40 cents in the last two days, and Straits tin, which was close to 65 cents most of last week, has been in the neighborhood of 66 cents since Monday. Lead has sold in satisfactory volume at unchanged prices, and the minor metals are also practically unchanged.

## Good Volume of Business Maintained in Middle West

Continued good business is reported from most sections of the Middle West. The volume is holding up well and indications point to favorable trends. There is considerable construction work under way among the various utility companies. Such work consists of additions to present plants, extension of service lines, and a large amount of underground construction. While no notably large orders for apparatus are being placed, numerous smaller orders for cable, circuit breakers, insulators, and switching devices have helped materially to maintain a good volume of business.

Jobbers sales are generally good. The volume of business transacted is not exceptional but is generally considered satisfactory. Appliance sales continue to show an increase over last year, one jobber placing an order for appliances valued at $30,000. Vacuum cleaners and washing machines are moving steadily, one interesting order placed this week being for 1,000 vacuum cleaners and another for 150 washing machines.

## Conditions Spotty in St. Louis but Business Fair

Reports from manufacturers and jobbers indicate a somewhat spotty business condition in the St. Louis district. Sales of building material have fallen off, and very little line hardware is selling, but some good orders have been placed for lighting fixtures. From the eastern Tennessee district a good volume of orders have been received for moderate-sized motors and equipment. A 625-kw. turbo-generator unit was sold for installation at Highland, Ill. Electrical merchandise sales are more than holding their own, and one manufacturer reports that July sales were 30 per cent above the estimated volume and that business in August will show an increase of 10 per cent above the estimate. Manufacturers of transmission cable and insulated wire have had good business from the territory to the south and southwest of St. Louis. Some very sizable shipments were made to Tennessee, Arkansas, and Texas, one order being material for the transmission line from Amarillo, Texas, to Carlsbad, New Mexico.

## New Engand Buying Quiet—Inquiries in Good Volume

Inquiries, rather than sales, feature the electrical trade activities throughout the New England district. Actual buying fell off on practically all commodities with the exception of material for new construction requirements. Small motor sales decreased in volume but, according to one manufacturer, the record for the year so far is 30 per cent above the volume reported for the corresponding period last year. Industrial equipment is attracting interest and the volume of negotiations is very encouraging. Industrial electric lighting is entering what promises to be a period of exceptional activity with many school-lighting installations already marking this trend.

In marked contrast to the temporary dullness in power equipment and central-station supplies, the demand for appliances is notably active. One manufacturer reports a steady growth of the merchandising division and notes the expansion of sales covering a wide range of appliances. Sales recorded by one group of central-station companies amounted to over $12,000 for the last week in August, ranges being in especially strong demand among resort communities.

## Line Construction Materials Active in Southeast

Generally satisfactory business is reported in the Southeast with few outstanding features. There is to be noted an increased activity among textile manufacturers, with orders and inquiries satisfactory. Orders for $25,000 worth of power transformers and $20,000 worth of motors were placed by one textile company, and the total volume of smaller orders for motor and transformer equipment is reported good. Purchases of electrical construction materials for industrial use are also satisfactory. There is a considerable amount of textile and small commercial business in prospect. One large textile job to be let next week and several other contracts will materialize within the next 60 days.

Central-station activities continue strong, the largest single purchase of the week being $90,000 worth of switching equipment for the New Orleans territory. Orders have been placed for the materials for a 400-mile transmission line in South Georgia, the construction of which will be undertaken shortly. Good business is reported in line materials for the rehabilitation of small distribution systems recently purchased by larger power companies and incorporated into their systems.

## Power Companies Quiet on Pacific Coast

Buying by power companies on the Pacific Coast has been quieter than in several weeks. Orders have included one for $20,000 worth of feeder regulators, and another for three gas-engine-driven arc-welding sets. Orders for five 100-amp., 7,500-volt line switches, and 10,000 lb. of medium hard-drawn bare copper wire for telephone service along the California and Oregon border were also placed. An export order covering the annual requirements of a telephone company called for two carloads of 45-ft. treated poles and a large quantity of line material. This order is to be shipped in quarterly installments. Industrial business included the sale of $7,500 worth of wiring supplies for an incubator company and $2,500 worth of reciprocating switches for a San Francisco manufacturer of heavy-duty radiators. An order was also placed by a chemical company in the Bay Point District for a 400-kw. synchronous converter complete with transformer and switching equipment at a cost of about $15,000. Other interesting miscellaneous orders covered two carloads of fiber conduits for street lighting in Los Angeles and 3,000 steel pins for a railroad company.

Several small motor orders were placed in Seattle, and one of considerable proportions was also awarded. An increase in inquiries was noted, and requests have been made for quotations for equipment for several projects, including a pulp mill, a lumber mill and a large sub-station. Small orders placed included motors for additions to shingle and lumber mills in and near Seattle, while a larger order for a 1,200-hp. synchronous motor, switchboard, etc., for a paper company in Spokane was also placed.

## Industrial Business Continues Active in New York District

Although sales to central-station companies in the New York district continue dull, an increasing activity in this field is forecast by the number of inquiries being received for quotations on switching equipment, hardware, etc. Transformers are comparatively inactive, but an increasing number of inquiries are being received with indications of a comparatively early resumption of good purchases. The demand for pole-line hardware for general maintainence work is fairly strong, although sales are somewhat less than they were last month. One order for approximately ten carloads of hardware has been placed, and a second order involving a considerable amount of hardware is reported to have been placed here by a foreign company. Sales of electrical equipment to both electrified and steam railroad companies are good, and include orders for equipment for three automatic substations which were placed by one railroad company during the past week. In the industrial field apparatus of the smaller sizes continues in active demand. Sales of control equipment are heavy, and inquiries in this line are also good. One order for about $50,000 worth of control equipment for printing machinery was placed recently, and considerable interest is being manifested in control apparatus for theatres. There continues to be a steady demand for motors, mainly of the 3-hp. and 5-hp. sizes, for machine tools, pumps, and general industrial purposes. A manufacturer in Brooklyn is also in the market for a total of 1,000 hp. in motors for plant extension.

# Activities of the Trade

### General Electric Gets Order from Bethlehem Steel Company

Two 6,500-hp. synchronous motors and the largest Scherbius equipment yet built have been purchased from the General Electric Company by the Bethlehem Steel Company for the new continuous skelp and sheet bar mill for its Sparrows Point plant near Baltimore. The synchronous motors are rated at 4,000 hp., 83.3 r.p.m., and 6,500 hp., 187½ r.p.m., 6,600 volts, three-phase, 60 cycles. These motors are the largest built for main roll drive with the exception of the 9,000-hp. General Electric motor in the River Furnace plant of the McKinney Steel Company at Cleveland.

The Scherbius equipment consists of a 6,700/5,000/3,320-hp., 500/375/250-r.p.m. induction motor, which is said to be the largest equipment using this type of adjustable speed drive. The mill is also driven by a 2,600/2,600/1,570-hp., 320/275/160-r.p.m. adjustable-speed direct-current motor. The generator for the direct-current motor and the Scherbius machines for the induction motor are all driven by one synchronous motor, making, with the exciter, a five-unit equipment.

**Hubbard & Company,** 6301 Butler Street, Pittsburgh, is now offering the Hubbard "Guyeye" nut, an eye nut and guy thimble in one piece. It is designed exclusively for use with guy strand and eliminates the guy thimble.

**The John D. Crawbuck Company,** Empire Building, Pittsburgh, has been organized to deal in used machinery. John D. Crawbuck, of the new company, has served in the Pittsburgh district and surrounding territory for the past sixteen years as president and general manager of the Miller-Owen Electric Company.

**The General Electric Company** announces that it has placed on the market an electric refrigerator, the type DR-2, which meets the requirement of the small apartment or home, and which embodies the characteristics of the previously announced larger machines, in that the refrigerating mechanism is contained in one unit.

**The Sundh Electric Company,** 5 Avenue C, Newark, N. J., manufacturer of control apparatus, announces that H. F. Darby, Jr., is now its representative for sales in the Philadelphia district with offices at 1700 Walnut Street. Mr. Darby is also a representative in that district for the Kuhlman Electric Company.

**The Reliance Electric & Engineering Company,** Cleveland, manufacturer of direct and alternating-current motors, has just placed a contract for a new addition to its main plant with the Austin Company, engineer and builder. The new unit will be 40 ft. x 80 ft., two stories high, and will greatly increase the production in the winding department. Aisles on the first floor will be served by 3-ton traveling cranes. This is the fifth plant extension on the Reliance Electric tract in the past fourteen years.

**The Pennsylvania Pump & Compressor Company,** Easton, Pa., announces that Samuel Arnold, 3d, 1306 Fulton Building, Pittsburgh, has been appointed its representative in the Pittsburgh district.

**The Industrial Controller Company,** Milwaukee, manufacturer of controlling devices, announces that Howard A. Cyr, formerly with the American Telephone & Telegraph Company, is now a member of the sales department of the New York office at 30 Church Street.

**The American Brown Boveri Electric Corporation,** 165 Broadway, New York City, has received a contract from the Board of Public Utilities, Jamestown, N. Y., for a 6,000-kw. turbo-generator with exciter and auxiliary equipment to be installed in the municipal electric power station. The bids submitted were as follows: American Brown Boveri Electric Corporation, $81,950; Westinghouse Electric & Manufacturing Company, $87,000; General Electric Company, $95,850, and the Allis-Chalmers Manufacturing Company, $99,835.

**The Westinghouse Electric & Manufacturing Company** announces that it has recently received an order from the Brown-Fayro Company of Johnstown, Pa., for a mine substation, including switching equipment for the control of a 200-kw. synchronous motor-generator set.

**The Industrial Tool Corporation,** 350 Madison Avenue, New York, announces that it is the sole distributor for the new "Cico" super-electric drills.

**The Crouse-Hinds Company,** Syracuse, N. Y., manufacturer of conduit fittings and other electrical products, is now offering a line of vaporproof safety switch condulets.

**I. T. Gray & Company,** 522 Fifth Avenue, New York, announce their appointment as sole distributors in this country for the "Triplex" drop-light system, made in Sweden. The unit is available in an adjustable roller drop light or in a drop extension light in various types.

**The Square D Company,** Detroit, announces that all the new Square D accessible and sealed main-fuse switches for three-wire grounded neutral systems are built with six meter terminals.

**The Air Preheater Corporation,** 25 Broadway, New York City, manufacturer of the "Ljungström" air preheater, announces that Howard Butt, formerly with the Riley Stoker Corporation, is now a member of its sales organization.

**The Westinghouse Union Battery Company,** Swissvale, Pa., announces the following change in its sales, engineering and executive departments: C. H. Smith, vice-president and general manager, has been made president and general manager; D. W. Souser has been appointed assistant to the president; J. K. Ross Duggan, manager of export, has been promoted to vice-president of sales; J. L. Rupp, sales manager, has been promoted to vice-president of engineering, and G. B. Cushing, assistant sales manager, has been promoted to sales manager.

**The Bridgeport Brass Company,** Bridgeport, Conn., announces that its New York office has been moved from the Pershing Square Building to the Farmers' Loan & Trust Company Building, 474 Fifth Avenue, at Forty-first Street.

**The Fullman Manufacturing Company,** 1209 Jefferson Street, Latrobe, Pa., manufacturer of "Latrobe" floor boxes and "Gem" insulator clamps, announces the appointment of Arthur E. Bacon, 1429 Eighteenth Street, Denver, as its district sales representative for the state of Colorado, and also the appointment of the Leigh A. Doxsee Company, 1911 Pine Street, St. Louis, as its district sales representative for the state of Missouri.

**The General Electric Company** announces that awards totaling $22,602 were paid to 2,172 employees during the first six months of the current year for suggestions which ranged from safety devices for the protection of workers to improved methods of manufacturing. In all 7,080 suggestions were made, an increase of approximately 1,500 over the first six months of last year, showing a gradual increase in the interest by employees in the company's suggestion system. For the first half of 1925 awards were made totaling $17,510 to 1,693 employees.

**The Westinghouse Electric International Company** announces the appointment of H. H. Rogge as special representative to the Philippine Islands. Mr. Rogge's territory will also include the Dutch East Indies, the Malay Peninsula and Siam. He will make his headquarters at Manila with the Edward J. Nell Company, which is the Westinghouse distributor for the Philippine Islands.

**The Pacific States Electric Company,** San Francisco, jobber, has announced plans for a new and larger building at the southwest corner of Bryant and Tenth Streets. The building will be 120 ft. x 295 ft., with three stories and basement, and will cost approximately $500,000. The company also announces that its Los Angeles branch is now established in new and larger quarters at 385 East Second Street.

**The Hub Electric Company,** 2219 West Grand Avenue, Chicago, manufacturer of switchboards, stage-lighting equipment, etc., announces the appointment of J. H. Rohs, formerly with the Mutual Electric & Machine Company of Detroit, as Eastern representative with offices at New York City. The company has recently secured the contract for the complete lighting and control equipment for the mammoth Roxy Theater being constructed in New York, for which will be furnished one of the largest stage switchboards yet constructed.

**The Burke Controller Company,** 607 West Forty-third Street, New York City, announces that it has taken over the manufacturing equipment together with the organization of the Miniature Breaker Company of Long Island City,

N. Y., manufacturer of protective devices known as "Minibreakers." The Burke company, in addition to manufacturing a line of automatic control and protective equipment, will continue the manufacture of "Minibreakers."

**The Weston Electrical Instrument Corporation**, Newark, N. J., has awarded a general contract for the construction of a two-story-and-basement addition, 42 ft. x 130 ft., to be used primarily for office service.

# New Equipment Available

## Electric Hoist

A 1-ton electric hoist that is said to be compact, requires low head room and has provisions for safe operation has been placed on the market by the Harrington Company, Seventeenth and Callowhill Streets, Philadelphia. The hoist is driven by a 2½-hp. universal series-wound motor. The gear train consists of two pairs of spur gears, worm and worm wheel, all of which are inclosed in an oil-tight compartment. Ball bearings are employed on the motor, worm and other parts. Gears and main bearings are lubricated automatically by means of an oil bath and circulating system, and the worm is entirely immersed in oil. The gross weight of the hoist is 290 lb.

## Tool Grinder

A single-phase tool grinder using a static condenser in the starting circuit has been developed by Forbes & Myers, 172 Union Street, Worcester, Mass. This new model 75 electric tool grinder is of the flat front type introduced by the company 4 years ago. The flat is but 1⅞ in. from the center of the shaft, so that the 6-in. wheels project well in front of the motor. The motor develops ¼ hp. and is fully enclosed. The use of a condenser on this motor eliminates brushes, commutators, centrifugal devices or clutches. The condenser used is a standard unit of 4 mfd. capacity with a test voltage of 2,000. The grinder is made for 110-volt or 220-volt service and for 50 or 60-cycle current.

## Protective Cutout for Subway Service

A new type of protective cutout for subway service has been developed by the General Electric Company in collaboration with engineers of the Great Western Power Company. This cutout is applicable to the protection of transformers and other apparatus on underground systems up to 15,000 volts, and is normally rated 200 amp. at 15,000 volts with a rated interrupting capacity of 5,000 amp. In a number of tests made it was found that the time necessary for interruption of the circuit exceeded one-half cycle in only one or two cases.

The new explosion-chamber subway-type oil fuse cutout and switch consists essentially of a welded steel tank, reinforced with steel bands, in which is contained an explosion chamber fuse holder immersed in oil. The explosion chamber fuse holder is controlled by a handle extending through the right hand end, by means of which it may be lifted out and replaced in the contacts without opening the cover. The fuse holder is automatically located and locked in either the open or closed position by means of the handle. The steel cover is fastened to the tank with six hinged bolts, and a suitable gasket is placed between the cover and tank to make a water- and oil-tight joint. The tank, lined with insulation, is of rugged construction to withstand the pressures developed. The cutout is designated as the type FO, form AL-1. It has overall dimensions of 3 ft. 4¼ in. by 12¼ in. and is 22 1/16 in. high with the cover open. When filled with 17 quarts of oil it weighs approximately 185 lb. Holes are provided so that the cutout may be securely bolted to wall brackets on which it rests.

## Ditching Machine

A ditching machine, known as the 4-in. ditcher, and especially intended for digging 4-in. ditches at the curb such as are required for the installation

FOUR-INCH DITCHER CUTTING A TRENCH FOR AN ORNAMENTAL LIGHTING INSTALLATION

of cable for outdoor lighting installations, has been placed on the market by the Barber-Greene Company, Aurora, Ill. This machine is the same as the company's standard ditcher except that it has a special vertical boom cutting 4 in. wide and 18 in. deep. It is said that this machine has cut 1,000 ft. an hour several times and has often been able to excavate 7,000 ft. a day.

## Horn-Gap Switch

A new triple-pole, horn-gap switch for outdoor disconnecting and sectionalizing service has been placed on the market by the General Electric Company and bears the designation TA-1. This is a 400-amp. switch manufactured in maximum ratings of 15,900, 25,000, 37,000, 50,000 and 73,000 volts. It is for horizontal mounting and may be either manual or motor operated. This switch is a tilting insulator switch with high-pressure, self-aligning contacts. It is made up of single-pole units mounted on galvanized-steel channels with three standard pin-type insulators per pole. The middle insulators of each pole carry the movable blades and are tilted on a common, solid square shaft.

The self-aligning contacts consist of two hard-drawn-copper half-cylinders inclosed in a housing and pressed together by double-coil steel springs. The blades, pinned to the tilting insulator caps to allow a slight motion, enter the floating stationary contacts from any reasonable angle and make good contact. This entry is made with a wiping action for the purpose of securing clean contact.

## Cable Tester

The Rawson Electrical Instrument Company, Inc., Cambridge, Mass., has developed a new portable cable tester for locating high-resistance faults and for making other tests. The device, mounted in a compact case, consists of a high-sensitivity multi-range voltmeter, switching apparatus and a double-commutator unit, and it operates without the necessity of burning the fault down. The fall of potential method for locating faults is used. Variable earth currents previously have been a handicap to this method, but this difficulty has been eliminated by the use of the double commutator, which distributes a practically flat-topped alternating-current wave through the circuit, collecting it on the second commutator and reconverting it to direct current for use in the voltmeter. High-resistance faults from 5,000 ohms to 10,000 ohms can be located as well as short circuits, together with accurate measurements of line resistance and insulation resistances up to 10,000 megohms.

## Electric Hoists

Six new electric monorail hoists, ranging in capacities from 3 tons to 12 tons, have been placed on the market by the American Engineering Company, Philadelphia, as additions to its line of "Lo-Hed" hoists. Each of the new hoists is made in types for bolt suspension, hand-geared trolley, motor trolley and cab control. Open cabs are provided for indoor use and closed cabs for outdoor service. The hoists can also be supplied with push-button control or remote control, and foundry-type control is provided when desired.

The company states that these hoists, which are designated as "Class J, Lo-Hed" electric hoists, embody the same principles of design that characterize the other models of "Lo-Hed" hoists, with such additional features as are made necessary by the higher speeds at which they operate and the heavier loads they are designed to handle. In all "Lo-Hed" hoists the drum and motor are placed on opposite sides of the I-beam track, so that the load block can be drawn up between them until it almost touches the rail.

# New Trade Literature

LIGHTING FIXTURES.—Catalog No. 27 issued by the Michigan Chandelier Company, 3130 Chene Street, Detroit, illustrates and describes a few picked lines, which compose the latest styles and best sellers for the season of "Lincoln" lighting fixtures.

RAILROAD YARD LIGHTING.—Bulletin GEA-131, covering this subject and issued by the General Electric Company, seeks to point out the advantages of railroad yard lighting. A discussion of the different systems of railroad yard lighting is included, and in addition to information on the construction of the floodlighting projectors employed in this service complete illumination data on the use of these projectors are given in tabular form.

MOTORS.—Bulletins GEA-71A issued by the General Electric Company describe respectively direct-current crane and hoist motors, type CO-1820, and wound-rotor induction motors—900 series, constant and adjustable varying speed.

SAFETY SWITCH CONDUIT FITTINGS.—Bulletin No. 2091 issued by the Crouse-Hinds Company, Syracuse, N. Y., describes the type ZT series of vaporproof safety-switch condulets.

DROP LIGHTS.—A bulletin describing the "Triplex" adjustable roller drop lights and the "Triplex" drop extension lights is being distributed by I. T. Gray & Company, 522 Fifth Avenue, New York.

MOTOR-GENERATOR SETS, ARC-WELDING APPARATUS AND VERTICAL MOTORS.—The General Electric Company has issued bulletins GEA-394, GEA-453 and GEA-470, describing respectively its induction motor-generator sets from 1 kw. to 35 kw., 125 or 250 volts; semi-automatic welding equipment, and its constant-speed, direct-current vertical motors, from ½ hp. to 200 hp.

FLOODLIGHTING AND THEATER LIGHTING.—Bulletins Nos. 2092 and 2090 issued by the Crouse-Hinds Company, Syracuse, N. Y., describe respectively the type LCE 24-in. "Imperial" floodlight projector and aisle and exterior theater lighting.

ARC-WELDING APPARATUS.—"Automatic Arc-Welding Apparatus" is the title of bulletin GEA-452 issued by the General Electric Company and describing the GE automatic arc-welding head and accessories. The bulletin also describes and illustrates the control equipment as well as the operation of the equipment.

# Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Dresden, Germany (No. 21,692), for machine tools for electrical industry.

An agency is desired in Berlin, Germany (No. 21,696), for electric household appliances.

An agency is desired in Berlin, Germany (No. 21,696), for electric refrigerators.

An agency is desired in Berlin, Germany (No. 21,696), for electric heaters.

An agency is desired in Rio de Janeiro, Brazil (No. 21,930), for electrical household appliances and lighting equipment.

An agency is desired in Rio de Janeiro, Brazil (No. 21,930), for electrical refrigerators.

An agency is desired in Bombay, India (No. 21,965), for motors and dynamos, electrical accessories, and electric fans.

An agency is desired in Leipzig, Germany (No. 21,968), for electrically operated hotel devices.

An agency is desired in Leipzig, Germany (No. 21,968), for electrical refrigerators.

An agency is desired in Leipzig, Germany (No. 21,969), for motors and electrically driven tools.

Specifications have been issued by the Victorian Railways Commissioners of Melbourne, Australia, inviting bids on a rotary converter and rectifier, together with switching equipment for its automatic operation. The closing date is Dec. 1, 1926. Copies of the specifications will be lent by the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce. Refer to No. Australia 218,580.

# Construction News

**Projects, Plans, Bids and Contracts, Contemplated or Under Way**

## *New England States*

HARTFORD, CONN.—The Arrow Electric Company, 103 Hawthorne Street, has tentative plans under way for the early construction of an addition to its plant to cost close to $50,000, with machinery and equipment installations.

DORCHESTER, MASS.—The Transit Commission, Boston, is having plans prepared for an $800,000 power house to be erected at Harrison Square. E. R. Springer, 1 Beacon Street, is the engineer.

INDIAN ORCHARD, MASS.—The Chapman Valve Company has completed plans for the construction of a two-story and basement addition, 54 ft. x 100 ft., to be equipped as an electric service and maintenance plant for the entire works. It is estimated to cost about $75,000.

## *Middle Atlantic States*

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until Sept. 14, for electrical supplies, including batteries, cable clips and thimbles, marine lights, etc. (Panama Circular 1753); also, until Sept. 15, for electrical machinery and auxiliary equipment for Diesel electric tugs (Panama Circular 1754.)

WASHINGTON, D. C.—Bids will be received by the United States Engineer, Navy Building, Washington, until Sept. 30, for furnishing, installing and testing two generators, automatic switching and auxiliary electrical equipment.

CARTERET, N. J.—The Public Service Electric & Gas Company, Newark, N. J., has authorized the immediate construction of a one-story substation on Atlantic Street, with intital capacity of 8,000 kva.

JERSEY CITY, N. J.—The Chillingworth Manufacturing Company, West Side Avenue, plans the installation of electric power equipment in connection with the proposed rebuilding of the portion of its steel and metal-working plant, recently destroyed by fire with loss of about $100,000.

JERSEY CITY, N. J.—The Seaboard Terminal Refrigerating Company will install electric power equipment in its proposed ten-story cold-storage and refrigerating plant at Eleventh, Twelfth, Monmouth and Cole Streets, to cost about $2,000,000.

MORRISTOWN, N. J.—A proposition is under consideration for the installation of a new street-lighting system on Speedwell Avenue.

FAR ROCKAWAY, N. Y.—The Queens Borough Gas & Electric Company has taken out a permit to erect a one-story substation, 35 ft. x 36 ft., on the Beach Channel Drive, near 108th Street. E. L. Phillips & Company, 50 Church Street, New York, are architects.

HUDSON, N. Y.—The City Council has plans under way for the construction of a central station for a police alarm system. Victor R. DeProsse, South Fourth Street, is architect.

LONG ISLAND CITY, N. Y.—The A. C. Horn Company, Bodine Avenue, plans the installation of electric power equipment in its proposed three-story plant on Hancock Street, estimated to cost $100,000.

NEWFANE, N. Y.—Additional street lighting facilities, including ornamental lamps in the business section, are proposed and under way by the village Board of Trustees.

STATEN ISLAND, N. Y.—Bids will be received by the Superintendent of Lighthouses, Staten Island, until Sept. 7 for not less than four nor more than twelve self-supporting structural steel radio antenna towers (Proposal 22351).

CANONSBURG, PA.—The Continental Can Company, Syracuse, N. Y., plans the installation of electric power equipment in its proposed local plant, estimated to cost about $150,000.

PHILADELPHIA, PA.—The board of trustees, University of Pennsylvania, will soon begin the erection of a new three-story building at Thirty-third and Walnut Streets, to be equipped for instruction in electrical engineering. It is estimated to cost $150,000, with equipment.

PHILADELPHIA, PA.—The Philadelphia Electric Comany has awarded a general contract to the John N. Gill Construction Company, City Centre Building, for the erection of a 23-story-and-basement office and operating building, 100 ft. x 100 ft. at Ninth and Sansom Streets, estimated to cost $3,000,000. John T. Windrim, Commonwealth Building, is architect.

PITTSBURGH, PA.—The Duquesne Light Company has filed plans for the construction of a one-story substation on McKnight Street, estimated to cost about $20,000.

SHARON, PA.—Plans are under consideration by the City Council for the continuation of the white way system over South Dock Street.

LEBANON, VA.—The Appalachian Power Company, Bluefield, W. Va., is completing negotiations for the purchase of the plant and system of the Lebanon Light Company and plans extensions in transmission lines for local service.

BLUEFIELD, W. VA.—The City Commission is considering the installation of an ornamental lighting system on Stewart Street.

HOLDEN, W. VA.—The Island Creek Coal Company has preliminary plans under way for the construction of one or more electric power plants for service at its mining properties. The ultimate project is expected to consist of three individual operating units, with cost reported at close to $95,000.

## *North Central States*

CHICAGO, ILL.—The Parisian Novelty Company will install electric power equipment in its proposed new plant on Western Avenue, near Thirty-fifth Street, reported to cost about $350,000, with equipment.

CHICAGO, ILL.—The W. F. Williamson Advertising Service, 3501-19 Addison Street, plans the installation of electric power equipment in its proposed one-story plant on local site, estimated to cost about $200,000, with machinery.

GEORGETOWN, ILL.—The installation of a better lighting system on M Street between Twenty-seventh and Thirty-sixth Streets is under consideration.

QUINCY, ILL.—The Illinois Public Service Company, Springfield, Ill., has preliminary plans under way for a three-story-and-basement storage and distributing plant at Seventh and York Streets, estimated to cost about $65,000.

INDIANAPOLIS, IND.—The Eel River Power Company, organized a number of months ago by T. R. Mead, head of the Mead-Balch Construction Company, Indianapolis, and associates, has preliminary plans under consideration for a proposed hydro-electric generating plant on the Eel River, Putnam County. The entire project is reported to cost in excess of $1,000,000, with transmission system.

MELVIN, IOWA.—The Northwestern Light & Power Company, Mayville, Wis., is completing negotiations for the purchase of the municipal electric light and power plant, and plans extensions in transmission system.

PIONEER, IOWA.—The Central Iowa Power & Light Company has secured a franchise for local light and power service and plans extensions in transmission line and the installation of substation equipment. The company is also completing negotiations for the purchase of the municipal electric lighting plant at Varina, Iowa, and contemplates extensions in transmission lines in this section.

LOUISVILLE, KY.—Bruce F. Hardy, after a conference with officials of the Louisville Gas & Electric Company, Louisville, has announced that negotiations had been completed whereby the Louisville company will extend a transmission line at a cost of $30,000 to the towns of Lexington, Blocher, Deputy and Paris Crossing, Ind.

LOUISVILLE, KY.—The Kentucky Utilities Company plans many improvements. A substation at Madisonville will be built together with a 33,000-volt transmission line connecting the new and old substations. Two miles of transmission line will be built to connect Greenville and Fredonia, with a substation at the latter point. Three 250-

kva. transformers will be installed at Chevrolet, and three 200-kva. transformers will be replaced at the Bryson Mountain substation, near Middlesboro. The Lawrenceburg-Midway 11,000-volt transmission line will be strengthened with new poles. Cawood substation will be enlarged by the replacement of three 150-kva. transformers. Two 50-kva. transformers will be installed at Clay and Wheatcroft. Two 100-kva. transformers and a steel-tower substation will be installed at the Black Mountain substation. A 100-kva. transformer will be installed at the Diamond Coal Company mines, near Madisonville. A 2,300-volt distribution line will be built from Greensburg to the fair grounds, just outside the town.

LOUISVILLE, KY.—The Kentucky Hydro-Electric Company has been granted Federal permission for the construction of a hydro-electric power plant at United States Dam No. 7, Kentucky River, Mercer County, Ky.

DETROIT, MICH.—The Northern Electric Company has arranged for a bond issue of $3,000,000, a portion of the proceeds to be used for hydro-electric power development, comprising two individual operating units, in the Michigan peninsula district, on the Menominee River. J. G. Rosebush is president.

DETROIT, MICH.—The Packard Motor Car Company, East Grand Boulevard, plans the installation of electric power equipment in its proposed three-story addition on Packard Avenue, near Harper Street, estimated to cost $350,000. Albert Kahn, Marquette Building, is architect.

HENDERSON, MINN. — The People's Minnesota Gas & Electric Corporation, Minneapolis, Minn., has acquired the plant and system of the Henderson Light & Power Company and will furnish service. Extensions in transmission lines are planned.

HIBBING, MINN.—The City Council is considering extensions in the ornamental lighting system on Howard Street to Eighth Avenue.

ST. PAUL, MINN.—The Luley Abattoir Company, North Cleveland Avenue, plans the installation of electric power equipment in its proposed cold storage and refrigerating plant on the line of the Minnesota Transfer, estimated to cost about $150,000. A. F. Gauger, Exchange Bank Building, is architect.

STAPLES, MINN.—The City Council is considering a petition for the installation of an ornamental lighting system in the downtown district.

THIEF RIVER FALLS, MINN. — The City Council has authorized extensions in the lighting system to a number of outlying districts. The Water and Light Department is in charge.

ALBA, MO.—The town Council has tentative plans under consideration for the installation of a light and power system.

INDEPENDENCE, MO.—Approximately $55,000 will be spent to modernize the municipal electric plant. New equipment will be purchased and the boiler room will be reconstructed.

PURCELL, MO.—The City Council has authorized preliminary plans for the installation of a municipal lighting system.

GRAND ISLAND, NEB.—The Central Power Company has plans under way for extensions and betterments in its Riverside power plant, reported to cost about $60,000.

LINCOLN, NEB.—The Lincoln Public Service Company has torn down part of the old powerhouse taken over from the Traction company and will spend $90,000 in building a combination garage, office building and warehouse two stories in height, on the site. It will be strictly a service building for the electric, heat and gas departments of the company.

LINCOLN, NEB.—The municipal lighting plant is having plans drawn for a considerable enlargement of the area in the downtown district of its ornamental lighting system.

HAMILTON, OHIO.—Bids will be received by G. C. Mitchell, Service Director, until Sept. 15, for equipment for a municipal electric light and power plant, including two 3,000-kw. turbo-generators, 50-kw. steam turbine-driven exciter set, three 500-hp. boilers, mechanical stokers and auxiliary equipment. Alternate bids are asked on boiler units with pulverized-fuel equipment and Diesel-engine generating sets. The entire plant is estimated to cost approximately $500,000.

SALEM, OHIO.—Plans are under way for the installation of an ornamental lighting system, with underground wiring, in the business streets.

MILWAUKEE, WIS.—Plans are under consideration by the Milwaukee Electric Railway & Light Company to extend its power lines to serve the towns of Richfield, Erin, Hartford, the summer resort at Freiss Lake and rural communities en route.

PRAIRIE DU CHIEN, WIS.—The City Council has contracted with the Interstate Power Company for the installation of an ornamental lighting system on portions of Church and Bluff Streets in the business section.

WAUSAU, WIS.—A transmission line will be built by the Wisconsin Valley Electric Company to connect with the properties of the Wisconsin Northern Light, Heat & Power Company at Mosinee, which is extending lines into the towns of Knowlton, Dancy, Moon and Halder.

## *Southern States*

HOLT, ALA.—The Alabama Power Company plans the installation of a modern lighting system and the erection of a substation to cost about $30,000. The company also plans to extend its lines.

HUNTSVILLE, ALA. — The Alabama Power Company, Birmingham, Ala., is planning the installation of an ornamental lighting system on Washington, Clinton and Jefferson Streets in the downtown district.

ST. PETERSBURG, FLA. — The City Council is considering the installation of an ornamental lighting system on a portion of the municipal pier.

SARASOTA, FLA.—The City Council has tentative plans under consideration for extensions in the street-lighting system, reported to cost in excess of $15,000.

WAUCHULA, FLA. — Work will soon begin on the lighting extension line which is to run from the north city limits down the Dixie Highway to Rainey Boulevard.

BAINBRIDGE, GA.—A lot measuring 50 ft. by 56 ft. on the Albany Road has just been purchased by the Bainbridge Power Company, which will erect on it a substation and switching point from its main line, an operator's house and a double set of transformers.

GAINESVILLE, GA.—Johnson & Johnson, Inc., New Brunswick, N. J., plans the construction of a power plant at its proposed local textile mill. The entire project will cost in excess of $300,000.

JENNINGS, LA.—The Louisiana Electric Company, Lake Charles, La., has completed negotiations for the purchase of the local municipal ice-manufacturing plant and will remodel and improve; electric equipment will be installed.

LAKE ARTHUR, LA.—The Louisiana Electric Company, Lake Charles, La., has concluded negotiations for the purchase of the municipal electric lighting plant and contemplates extensions in transmission lines.

NEW ORLEANS, LA.—Bids will be received by the Sewerage and Water Board, 526 Carondelet Street, until Oct. 15, for transformers and auxiliary equipment for power house No. 2, as per specifications on file.

HENDERSON, N. C.—R. E. Scott, Mutual Building, Richmond, Va., is at the head of a project to construct and operate a hydro-electric power plant on the Roanoke River, near Henderson, for which a site has been secured. The project is expected to cost in excess of $250,000. C. C. Chambers, Clarksville, N. C., is engineer, in charge.

WOODLAND, N. C.—The Virginia Electric & Power Company, Richmond, Va., is considering the construction of a transmission line from a point near Scotland Neck, N. C., to Woodland, for commercial light and power service.

AFTON, OKLA. — The Public Service Company has acquired the old Hill property and plans to erect an ice-storage plant electrically equipped and operated.

KETCHUM, OKLA.—A hydro-electric power plant is projected on the Grand River in Mayes County which, it is said, will be one of the largest water-power projects in the Southwest.

OKLAHOMA CITY, OKLA.—The City Commission has approved plans for extensions in the street-lighting system.

OKMULGEE, OKLA.—The City Council has passed a resolution which provides for lengthening the city white way along Main Street.

DENMARK, S. C.—The Denmark Wood Products Company plans the purchase of a 100-kw. or 125-kw. generator, with engine and auxiliary electric equipment, in connection with the proposed electrification of its local plant.

LEXINGTON, S. C.—The Broad River Power Company, Columbia, S. C., is reported to be planning extensions in its local lighting system, including the rebuilding of a portion of the present lines.

CORPUS CHRISTI, TEX. — The Texas Central Power Company, San Antonio, Tex., has preliminary plans under advisement for extensions and improvements in its local power plant, including the installation of equipment to advance the output about 45,000 hp. The company also plans for expansion in its auxiliary steam-operated electric power plant at Kingsville, Tex.

FANNIN, TEX.—The City Council plans the installation of an ornamental lighting system.

HOUSTON, TEX.—The Trinity Portland Cement Company, Dallas, Tex., plans the construction of a power plant at its proposed local mill at the Buffalo Bayou and North York Street. The entire project will cost in excess of $1,250,000. O. B. Bartholomew is chief engineer.

MIDLAND, TEX.—The City Council is planning the installation of an improved street-lighting system.

WELLINGTON, TEX.—The Texas Central Power & Light Company, San Antonio, Tex., has negotiations under way for the purchase of the municipal electric light and power plant and contemplates extensions in transmission lines.

## *Pacific and Mountain States*

TOMBSTONE, ARIZ.—Bids will be received by the City Council until Sept. 13 for equipment for a municipal electric light and power plant, including one 50-kva. and one 25-kva. generating unit, with accessories; also, at the same time for equipment for a proposed municipal ice-manufacturing plant. (A contract recently let to Jules Vermeisch, Phoenix, Ariz., engineer, has been rescinded). R. V. Saunders is city clerk.

GLENDALE, CAL.—The City Council has adopted a resolution providing for the installation of an ornamental lighting system on Ridgeway Drive, from Kenneth Road, north; also, for the installation of a similar system on a portion of Cumberland Road. Bids will be asked at an early date.

LOS ANGELES, CAL.—The Kroehler Manufacturing Company, 5111 Santa Fe Avenue, plans the installation of electric power equipment in its proposed three-story-and-basement furniture factory on the Redondo Boulevard near Damask Street, estimated to cost $250,000.

REDLANDS, CAL.—The Southern California Edison Company, Los Angeles, Cal., has approved plans for the construction of a one-story substation, 23 ft. x 43 ft., at Ninth Street and High Avenue.

BUTTE, MONT.—The Royal Development Company, Butte, Mont., has secured federal permission for a proposed hydro-electric power development on Phelps Creek, Chelan County, Wash., the plant to be used primarily for service for mining operations.

WINSTON, MONT.—The Montana-Idaho Copper Company plans the installation of electric power equipment at its East Pacific mine. A transmission line will be constructed for a distance of about 3 miles for power service.

LA GRANDE, ORE.—Bids will be asked by the City Council in September for the installation of an ornamental lighting system on portions of Adams, Fir, Chestnut, Elm and Depot Streets. Standards will be about 16 ft. high, ornamental design.

TACOMA, WASH.—Petitions have been filed for the installation of ornamental lights on L and M Streets, Division Avenue to North Sixth Street; Cushman, Sheridan, Ainsworth and Grant Avenues, K Street to Sprague Avenue and North Sixth Street.

## *Canada*

QUEBEC, QUE.—It has been officially announced that the Duke-Price Power Company, operating in the province of Quebec, intends to enlarge certain dams and other structures on the Grand Discharge and Little Discharge Rivers.

RAWDON, QUE.—The Quebec Southern Power Company is making extensions to its system, totaling over 40 miles, to serve a number of towns in the immediate district.

# Electrical Patents

**Announced by U. S. Patent Office**

(Issued Aug. 17, 1926)

*1,549,891. HIGH-TENSION TRANSFORMER; W. Petersen, Darmstadt, Germany. App. filed Jan. 26, 1922. In which the coils of the high-tension windings are carried upon an insulating hollow sleeve or cylinder which is separated from the low-tension winding and the core by an air jacket of ample dimensions, so that stratified or strip-like electric discharges only and not brush or spark discharges can take place in the high-tension field. Arrangements applicable to single-phase or polyphase transformers of the above general character for more effectively stabilizing the electrostatic field at the portions of the high-tension insulation which are not covered by the winding. One or more stabilizing rings are provided in the space surrounding the high-tension insulation beyond the winding, the ring or rings being so formed and situated that a stabilization and as uniform a distribution as possible are produced in the electrostatic field.

1,596,007. DEVICE FOR CONTROLLING ELECTRIC CIRCUITS; H. K. Elliott, St. Paul, Minn. App. filed Jan. 13, 1923. Master switch for controlling several branch circuits.

1,596,013. CONTROL MECHANISM FOR ELECTRIC TOOLS; J. J. Gerhardt, Chicago, Ill. App. filed April 13, 1923. Using a momentary-contact switch with means for locking closed when desired.

1,596,018. THERMOSTATIC CUT-OUT SWITCH AND PLUG; G. Mueller, Cleveland, Ohio. App. filed Dec. 19, 1923.

1,596,021. ELECTRICAL REVERSING SWITCH; C. H. Tasmussen, Cleveland, Ohio. App. filed June 12, 1923.

1,596,027. DYNAMO-ELECTRIC MACHINE; L. Schuler, Berlin-Lichterfelde, Germany. App. filed March 5, 1924. Self-excited synchronous motors, self-excited compensated synchronous motors and converters. The number of commutator segments for a given voltage is increased to such extent that sparkless operation of the machine at starting and at all loads can be secured. Accomplished by providing the inducing member, which is usually the rotor, with an inducing winding, and with a ring winding for the production of the exciting emf.

1,596,030. ANODE; F. T. Taylor, Matawan, N. J. App. filed Jan. 17, 1925. Wherein the plating metal will be so disposed with regard to the electrolyte as to secure more regular and efficient disintegration of such metal into the solution and to eliminate the waste which oftentimes occurs, due to the scaling off of metallic particles from the anode.

1,596,080, 1,596,081. ELECTRIC-TOASTING DEVICE; I. E. Coleman, Los Angeles, Cal. App. filed Aug. 17, 1925. An oven toaster adapted to be molded from insulating material, a toaster housing having the switch box integral with the housing, a housing having the opening for insertion of the slice, in the end wall of the housing, a solid top for the oven or housing, and a toaster in which the slice-holder and its operative mechanism remains within the limits of the housing in its toasting position and in its slice receiving position.

1,596,131. COMBINED BATTERIES AND CHARGER FOR RADIO SYSTEMS; A. Vordberg, Jr., Arlington, Mass. App. filed Nov. 6, 1924.

1,596,141. ELECTRIC HEATER; T. G. Baugh, Lake Placid, N. Y. App. filed May 5, 1925. Wherein a forced draft by the heating means of the same will be effected.

1,596,151. ELECTRIC HAIR CURLER; J. H. Cannon, Los Angeles, Cal. App. filed July 7, 1924.

1,596,152. ELECTRICAL CONDUCTOR; C. E. Carter, Montreal, Canada. App. filed Nov. 29, 1924. Resistance conductor especially advantageous for use in supplying electrical energy at a predetermined and required voltage to a receiving means or apparatus from a source whose voltage is prohibitively higher than the loading capacity of said receiving apparatus.

*This patent was previously issued under a wrong classification.

1,596,159. VAPOR-PROOF LIGHTING UNIT; L. C. Doane, Meriden, Conn. App. filed Sept. 17, 1924.

1,596,181. SADIRON; L. M. Hills, Santa Monica, Cal. App. filed June 18, 1924. Which rolls on the work and allows the strength of the operator to be applied thereto in pressing, straightening or finishing.

1,596,184. STAND LAMP; P. M. Hotchkin, Chicago, Ill. App. filed June 18, 1923.

1,596,188. CONTACT MEANS FOR BATTERY CELLS; H. W. Jones, Flushing, N. Y. App. filed Oct. 27, 1923.

1,596,189. CAB SWITCH; J. J. Kennedy and C. W. Dake, Chicago, Ill. App. filed Dec. 20, 1923. Cab switch and dimmer or compensation switch for locomotive electric headlights.

1,596,234. ELECTRIC FUSE; J. C. Bogle, Oak Park, Ill. App. filed Dec. 4, 1922. Enclosed renewable fuse.

1,596,246. PROCESS OF TREATING INCANDESCENT-LAMP FILAMENTS; M. N. Freudenburg, Bloomfield, N. J. App. filed April 19, 1921. Means which tend to automatically terminate the life of an incandescent lamp when it reaches a point at which its operation becomes uneconomical, and means for maintaining the candle power of incandescent lamps.

1,596,254. PROJECTION AND CONTROLLING SYSTEM; A. D. Standeford, Kansas City, Mo. App. filed May 7, 1917. Means for regulating the voltage and amperage.

1,596,255. DYNAMO-ELECTRIC MACHINE; L. J. Stephenson, Chicago, Ill. App. filed March 28, 1921. Designed for driving traction vehicles or other machines, the speed of which must be adjusted and for driving machinery which is frequently started and stopped. Means for compensating for fluctuations in line voltage during either the motoring or the regenerating period, and means for securing the desired speed torque characteristic during both the motoring and the generating period.

1,596,264. IRONING MACHINE; R. V. Weller, Rochester, N. Y. App. filed Oct. 10, 1923. In which an iron and a bed are employed having a relative movement between them. Having the electrical heater controlled through the relative movement between the iron and the bed, so that when separation takes place between these two elements, the supply of current to the heater will be cut off.

1,596,270. ELECTRIC SWITCH; C. H. Jockmus, Ansonia, Conn. App. filed Feb. 4, 1924. Pull-chain switch.

1,596,278. ELECTRIC-GAS LAMP; A. Lederer, Vienna, Austria. App. filed Aug. 30, 1921. In which liquid electrodes, such as alkaline metals or their alloys, are employed. To prevent an electrode of the character indicated flowing from a vessel in which it may be contained upon disturbance of the lamp either by tilting or overturning.

1,596,306. FURNACE; H. C. Rentschler and J. W. Marden, East Orange, N. J. App. filed July 28, 1921. In which the material undergoing treatment assists in the operation of the furnace. A furnace in which metallic and semi-metallic substances may be heat-treated to render them workable; a vacuum electrical furnace in which the material being treated is adapted to complete the electrical circuit.

1,596,371. SUPPORT FOR ILLUMINATING UNITS; P. A. Nirdlinger, Chicago, Ill. App. filed Feb. 21, 1925. Intended primarily for use in operating rooms for surgeons and in other places where lighting without the casting of shadows is desirable.

1,596,410. EXCESS-DEMAND METER; L. Dorfman, Wilkinsburg, Pa. App. filed Jan. 30, 1920. Having a constant-speed device that shall be actuated from the circuit to which the meter is connected.

1,596,417. CIRCUIT INTERRUPTER; O. H. Eschholz, Wilkinsburg, and C. F. Wagner, Pittsburgh, Pa. App. filed Aug. 22, 1922. With means for facilitating the transfer of an arc from the main contact members to the arcing tips.

1,596,425. ALARM APPARATUS; D. L. Gordon, New York, N. Y. App. filed May 6, 1921. A device wherein a signal will be given when a closed door is forced away from its casing in an edgewise direction.

1,596,432. ELECTRIC SOLDERING IRON; G. D. Henson, Los Angeles, Cal. App. filed March 18, 1925. Having a chamber therein adapted to receive solder or similar materials to be melted, and to provide a heating element fpr heating the chamber so as to melt the solder within the soldering iron so that it may be readily applied to the work to be soldered.

1,596,436. REFILLABLE CARTRIDGE FUSE; L. Kellner, Chicago, Ill. App. filed April 17, 1925.

1,596,492. LAMP-LOCKING MEANS; L. Kulp, Chicago, Ill. App. filed April 23, 1924.

1,596,500. MERCURY-VAPOR ARC RECTIFIER OF GLASS; E. Marschner, Weissensee, near Berlin, Germany. App. filed Aug. 30, 1921.

1,596,505. ELECTRIC REGULATOR; W. E. Moore, Pittsburgh, Pa. App. filed Sept. 1, 1922. For alternating-current circuits. A regulator from which all contact making devices are eliminated. The necessary movements of the shiftable element for effecting regulation is obtained by means of control circuits which are permanently closed and in which the ohmic resistance is maintained substantially constant.

1,596,522. TRANSFORMER; F. J. Fischer, Dresden, Germany. App. filed Jan. 27, 1925. Arranged so that the primary windings may be converted from delta connection at light load, while the secondary windings are always star-connected whether at full load or light load, the transformation ratio being maintained in such a manner that the subdivided secondary windings are connected in parallel at full load and are double-star-connected at light load.

1,596,557. ELECTRIC CURRENT COLLECTOR; D. R. Scholes, Chicago, Ill. App. filed Dec. 1, 1921. Employed in connection with windmills that are arranged to drive electric-current generators for the purpose of furnishing charging current to storage batteries and when thus employed the contacting rings are arranged to turn with the windmill head and the contacting plates are arranged to be stationary, the conductors leading to the contacting plates extending through the hollow mast of the mill.

1,596,560. ALUMINUM RECTIFIER; Z. Takahashi, Ashikaga, Japan. App. filed Sept. 7, 1922. A lead tank is formed moderately flat to serve as one electrode as well as an electrolyte container, and an aluminum rod, which is vertically supported and serves as the other electrode, is arranged to always press the bottom of the lead tank under the weight of the rod itself and the action of springs through a thin plate of insulating material which can conduct electricity when wet with the electrolyte.

1,596,582. ELECTRIC MELTING FURNACE; J. R. Coe, Waterbury, Conn. App. filed Oct. 18, 1921. Induction type with special channel box and lining.

1,596,626. ELECTRICAL MEASURING INSTRUMENT; F. W. Roller, East Orange, N. J. App. filed Nov. 2, 1920. For the testing of storage battery cells.

1,596,684. ELECTRIC PLUG SOCKET; M. Propp, New York, N. Y. App. filed Feb. 11, 1924. Multiple electrical socket.

1,596,704. METHOD OF AND MEANS FOR CONTROLLING RESISTANCE; C. W. Yerger, Washington, D. C. App. filed Feb. 28, 1919. For motor circuits. Whereby a given resistance divided into a given number of sections may be utilized to afford an increased number of resistance gradations of the circuit including the same and whereby the number of switches heretofore required for effecting such number of resistance gradations may be materially reduced.

1,596,712. PROTECTOR FOR ELECTRIC METERS; J. J. Borger, Springfield, Mo. App. filed April 27, 1923.

1,596,719. AUTOMATIC LUBRICATING DEVICE; R. W. Conn, Newark, N. J. App. filed June 21, 1923. For machines for evacuating the bulbs of lamps.

1,596,725. LIGHTING FIXTURE; C. E. Ferree, Bryn Mawr, Pa. App. filed Dec. 9, 1924. Semi-indirect type.

1,596,732. METHOD OF AND MACHINE FOR MOUNTING FILAMENTS; J. J. Higgins, East Orange, N. J. App. filed Dec. 2, 1922. A machine which may be operated to automatically drape a filament onto support wires of a lamp stem, and which may be operated to positively feed a filament during a mounting operation.

1,596,733. TIPPING-OFF AND TRANSFER MECHANISM; J. J. Higgins, East Orange, N. J. App. filed June 9, 1924. A device for tipping-off an exhaust tube from an evacuated bulb and transferring the bulb for discharge from the machine.

1,596,736. MANUFACTURE OF LININGS FOR ELECTRIC FURNACES; R. C. Jetter, Waterbury, Conn. App. filed July 5, 1924. A method of and means for manufacturing furnace linings for induction electric furnaces.

1,596,747. ARC INCANDESCENT LAMP WITH SPECIAL ELECTRODES; C. F. Lorenze, East Orange, N. J. App. filed June 28, 1923.

# Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

## Copper and Kilowatts

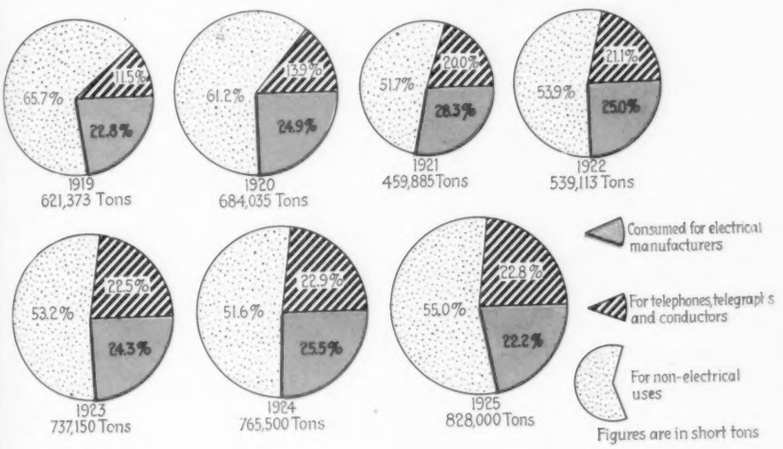
IN ACCOUNTING for interruptions to service recently an official of one of the important urban systems in central Europe pointed out that the installation had been so severely stripped of all copper which could possibly be spared for the manufacture of munitions that breakdowns and inefficiency due to the presence of inferior substitutes were inevitable and would necessarily continue for some time to come. The incident illustrates, if evidence were needed, the extreme importance of the red metal in the electrical industry. Requiring less cross-section than any other material except silver for a given conductivity, and available in large quantities in the crust of the earth, copper has become as essential to the electrical installation as steel is to building construction.

The accompanying charts, based on data published by the American Bureau of Metal Statistics, depict the relationship graphically. Taking first the years from 1919 to 1926, it is seen that in the United States the estimated consumption for electrical manufactures, exclusive of telephones and telegraph, light and power lines and trolley wire, accounts for about 25 per cent of the total consumption. If these other items are included, the total is augmented by an increasing fraction, so that during the past two years the aggregate of copper used for purely electrical purposes comes close to 50 per cent of the entire national consumption and therefore almost equals the amount required for the copper and brass used in automobiles, ships, plumbing fixtures, bearings and for other purposes.

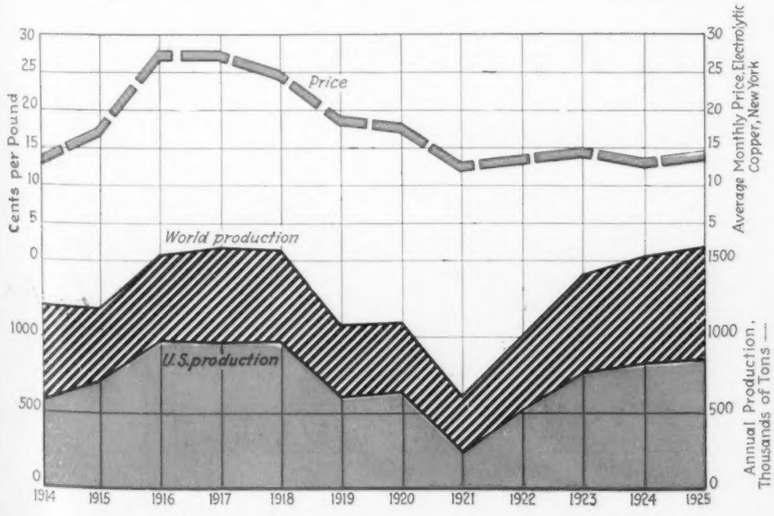
It is further evident that consumption has not only increased by a third in six years, but that the increase has been much steadier than the production, which was severely affected by the acts of various governments in pouring into commercial channels the huge stocks accumulated during the war.

This influence is reflected both in the striking rise of production during the war, followed by a remarkable depression, and in the corresponding price fluctuation, ranging from an average of 27.2 cents a pound in 1917 down to 12.5 cents in 1921, with a subsequent readjustment to a level closely approximating the 1914 price, and with a yearly average that has been more nearly stable for the past four years than during any equal period since 1911.

### Half the Copper Is Used for Electrical Purposes




### Copper Production and Prices Move Together




Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

# Manufacturing in the Southern States Prosperous

THE present year has witnessed an unusually prosperous condition in the manufacturing plants of the Southern States. Since the opening of the year industrial activity has been consistently above the operations reported for the same month of last year. Operations reached their peak in March, since which time industrial operations have steadily decreased, this being the reflection very largely of seasonal influences. July, the last month for which reports are available, found the industries of the South operating at 2.6 per cent above the operations reported in July of last year and 2.4 per cent above the average monthly for the past three years. Industrial activity in the section since the opening of the year has been slightly below that reported for the country as a whole. Such is the picture of industrial activity painted by the ELECTRICAL WORLD, based upon the monthly electrical energy consumption of about 400 large manufacturing plants in various industries and scattered throughout the section.

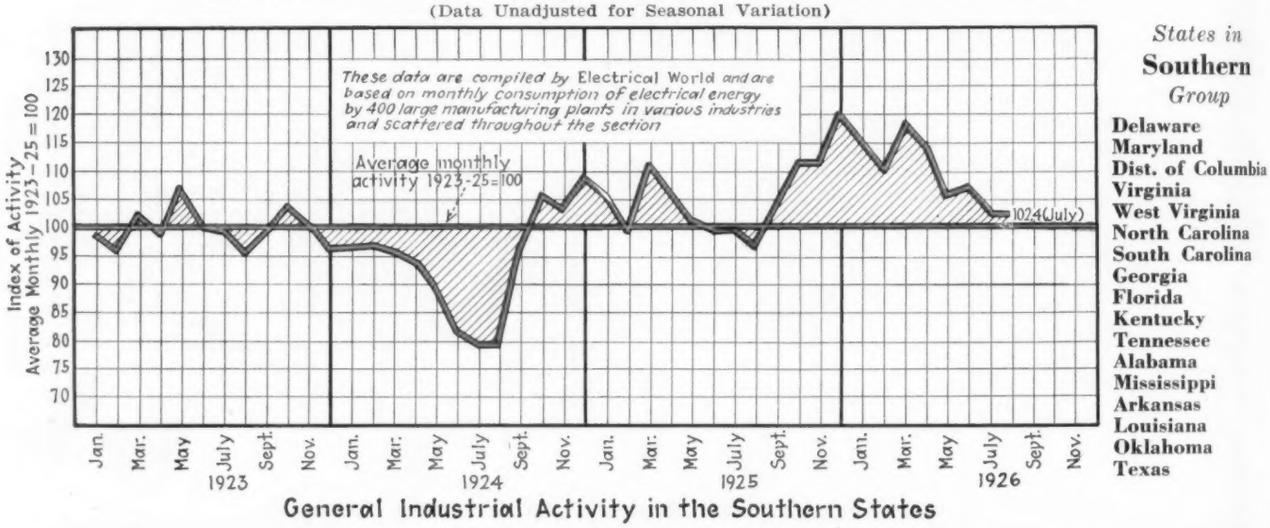
The returns received by the ELECTRICAL WORLD indicate that in July general industrial activity in the Southern States was 2.4 per cent above the average monthly for the past three years, this figure being unadjusted for seasonal variation, but weighted in accordance with the importance of the various industries. The prosperous condition of Southern industry today is even more clearly indicated when the fact is included that in July of last year general industry in the section was operating at 0.2 per cent below the average monthly. When it is remembered that July and August are normally the months of lowest industrial activity in the South, these high operating figures are even more significant.

The textile industry, the backbone of Southern business, reported the lowest activity of the year during July—3.3 per cent below the average monthly for the past three years—which activity, however, was 4.3 per cent above that reported for July of last year. July is normally the month of lowest production activity in the textile mills, so that this decreased activity is largely seasonal in character.

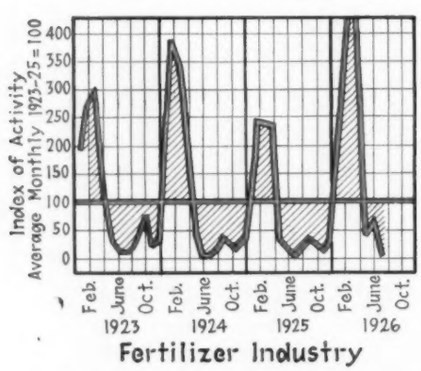
A material drop in the operations of the lumber mills in the Southern States was recorded during July. The high point of activity in this industry was reached last December, since which time, with the exception of March, activity has steadily decreased. July operations went 15.1 per cent under July of last year.

**"Electrical World" Barometer of Industrial Activity in the Southern States**

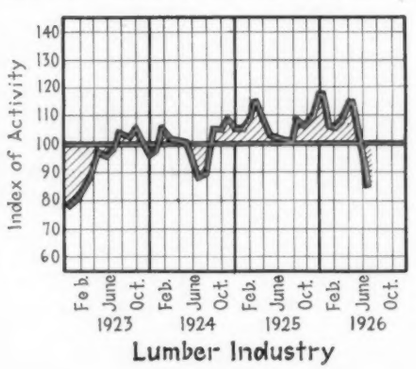
(Data Unadjusted for Seasonal Variation)


These data are compiled by Electrical World and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries and scattered throughout the section
Average monthly activity 1923-25=100
102.4(July)
Index of Activity Average Monthly 1923-25=100
130 125 120 115 110 105 100 95 90 85 80 75 70
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926
States in Southern Group
Delaware
Maryland
Dist. of Columbia
Virginia
West Virginia
North Carolina
South Carolina
Georgia
Florida
Kentucky
Tennessee
Alabama
Mississippi
Arkansas
Louisiana
Oklahoma
Texas

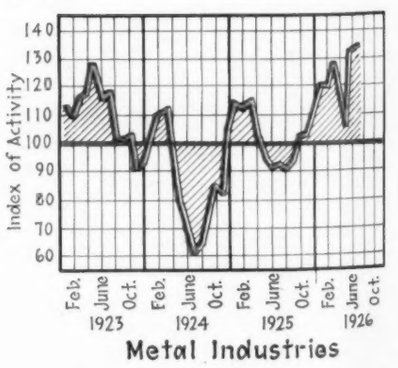
General Industrial Activity in the Southern States


Index of Activity Average Monthly 1923-25=100
400 350 300 250 200 150 100 50 0
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1923 1924 1925 1926

Fertilizer Industry



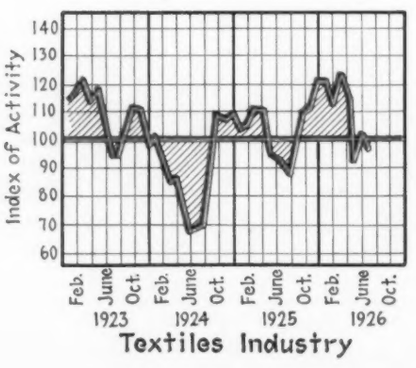

Lumber Industry



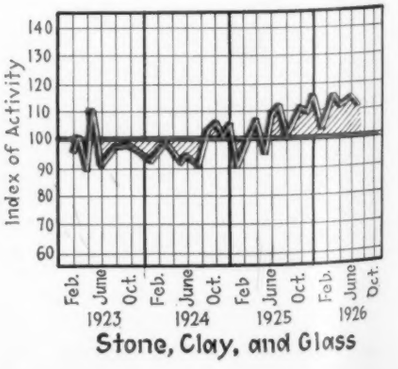

Metal Industries

Index of Activity Average Monthly 1923-25=100
140 130 120 110 100 90 80 70 60
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1923 1924 1925 1926

Paper Industry




Textiles Industry




Stone, Clay, and Glass